NOAA Technical Report NMFS SSRF-682

Heat Exchange Between Ocean and Atmosphere in the Eastern North Pacific for 1961-71

N. E. CLARK, L. EBER, R. M. LAURS,
J. A. RENNER, and J. F. T. SAUR

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DEPARTMENT OF COMMERCE
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NATIONAL OCEANIC AND
ATMOSPHERIC ADMINISTRATION
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ABSTRACT

Summaries of large-scale heat exchange between ocean and atmosphere in the eastern North Pacific Ocean are presented for the period 1961 through 1971. The summaries are based on computations made from synoptic marine radio weather reports and include 1) monthly values of total heat exchange and departures from a long-term mean; 2) long-term monthly mean values of the total heat exchange, incoming solar radiation, effective back radiation, and evaporative and sensible heat transfer; and 3) annual cycles of total heat exchange for selected areas.

Outstanding spatial and temporal features of the heat exchange values are discussed. However, little detail is given since this is a summary report, and readers can draw their own conclusions depending upon the intended use of the charts.

Comparisons are also made between the total heat exchange values and those given in two other reports. Discrepancies between values given in this report and those published in the other reports are attributed to differences in the empirical equations used to make the heat exchange computations, differences in data processing techniques, differences in the observed data used in the computations due to different methods of acquisition, and the possibility of ocean climate changes.

INTRODUCTION

The ocean's thermal structure is an important environmental variable that affects the distribution and abundance of marine fish populations (Sette, 1961; Uda, 1957, 1961). As part of a fisheries oceanography research program directed towards fisheries prediction, ocean temperature conditions and the air-sea interaction processes which are most often responsible for changes in this structure have been monitored in the eastern North Pacific since 1960. These data have been used to describe the interaction of ocean and atmosphere (Clark, 1972; Namias, 1969, 1971) in the eastern North Pacific and to identify and attempt to understand those ocean features that are important determinants of tuna distribution (Johnson, 1962; Flittner, 1970). They are also being used to evaluate the role of changing ocean conditions on other fish populations.

This report is a contribution to the MARMAP program of the National Marine Fisheries Service and presents summaries for use by fishery and other marine scientists of the derived heat exchange between ocean and atmosphere in the eastern North Pacific Ocean bounded by lat. 20° and 60°N and long. 115°W and 180° for the period 1961-71. The summaries were computed by 5° latitude-longitude quadrangles and are presented on charts of 1) the monthly values of total heat exchange and differences from the long-term mean; 2) the long-term monthly means of the total heat exchange, incoming solar radiation, effective back radiation, and evaporative and sensible heat transfer; and 3) the annual cycles of total heat exchange in selected areas.

Since air-sea interaction processes cannot, in general, be measured directly except for solar radiation, for which there are very limited measurements over the oceans, quantitative evaluation of these processes depends upon computations based on empirically derived formulas. Because these formulas are still the subject of extensive research, the heat exchange computations should be considered only as relative indices of the magnitude of the heat flux across the air-sea interface. However, we believe that the computations represented by the charts in this report can be used to evaluate large-scale features and to show year-to-year and month-to-month variations of this heat flux.

SOURCE AND DISTRIBUTION OF THE DATA

The source of data used in preparing the charts in this report is the synoptic marine radio weather report made by ships at sea. Cooperating American and foreign-flag vessels make, record, and transmit the standard marine weather observations according to established procedures set up by the World Meteorological Organization (WMO). Observations taken at 0000, 0600, 1200, and 1800 Greenwich Mean Time daily are transmitted to designated commercial and government radio stations around the world.

Between 8,000 to 10,000 synoptic marine weather observations from the eastern North Pacific are processed by computer each month at the National Marine Fisheries Service La Jolla Laboratory, and

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several summaries are compiled depending on their intended use. For a more detailed description of how the observations are received and processed, see Johnson, Flittner, and Cline (1965). Although specific program details have been changed, the present processing methods are essentially the same as those described in that publication.

Because the data are compiled from merchant and fishing vessel marine weather reports, the spatial and temporal distributions of observations over the ocean are irregular. Observations are most numerous in the major shipping lanes from San Francisco to Hawaii, from San Francisco to Japan, from Panama to San Diego, Los Angeles, and San Francisco, and from Seattle to Japan. Shipping lanes of secondary importance are from San Diego to Hawaii and Panama to Hawaii.

The average number of marine synoptic observations taken per month over the period 1961-71 by 5° quadrangles for the winter and summer seasons is shown in Figures 1a and 1b, respectively. The density of observations is shown in class intervals of 50 as indicated on the charts. Compilations made for the spring and fall seasons show the density distribution for spring similar to that of winter and the density distribution for fall similar to that of summer.

In all seasons, most observations are taken along the shipping lane between San Francisco and Hawaii and the coastal route from Panama to U.S. west coast ports. The least number of observations are taken northwest of Hawaii and between lat. 25° and 30°N during the summer season. The main difference between the winter and summer distributions is the southward shift of greatest observation density west of long. 145°W from the great circle route to Japan during summer to between lat. 30° and 35°N during winter.,

INITIAL DATA PROCESSING AND CHART PREPARATION

Marine Environmental Variable and Heat Exchange Summaries

An intermediate step between reception of the synoptic marine data and preparation of the charts presented in this report is the compilation by 5° quadrangles of monthly mean marine synoptic variables

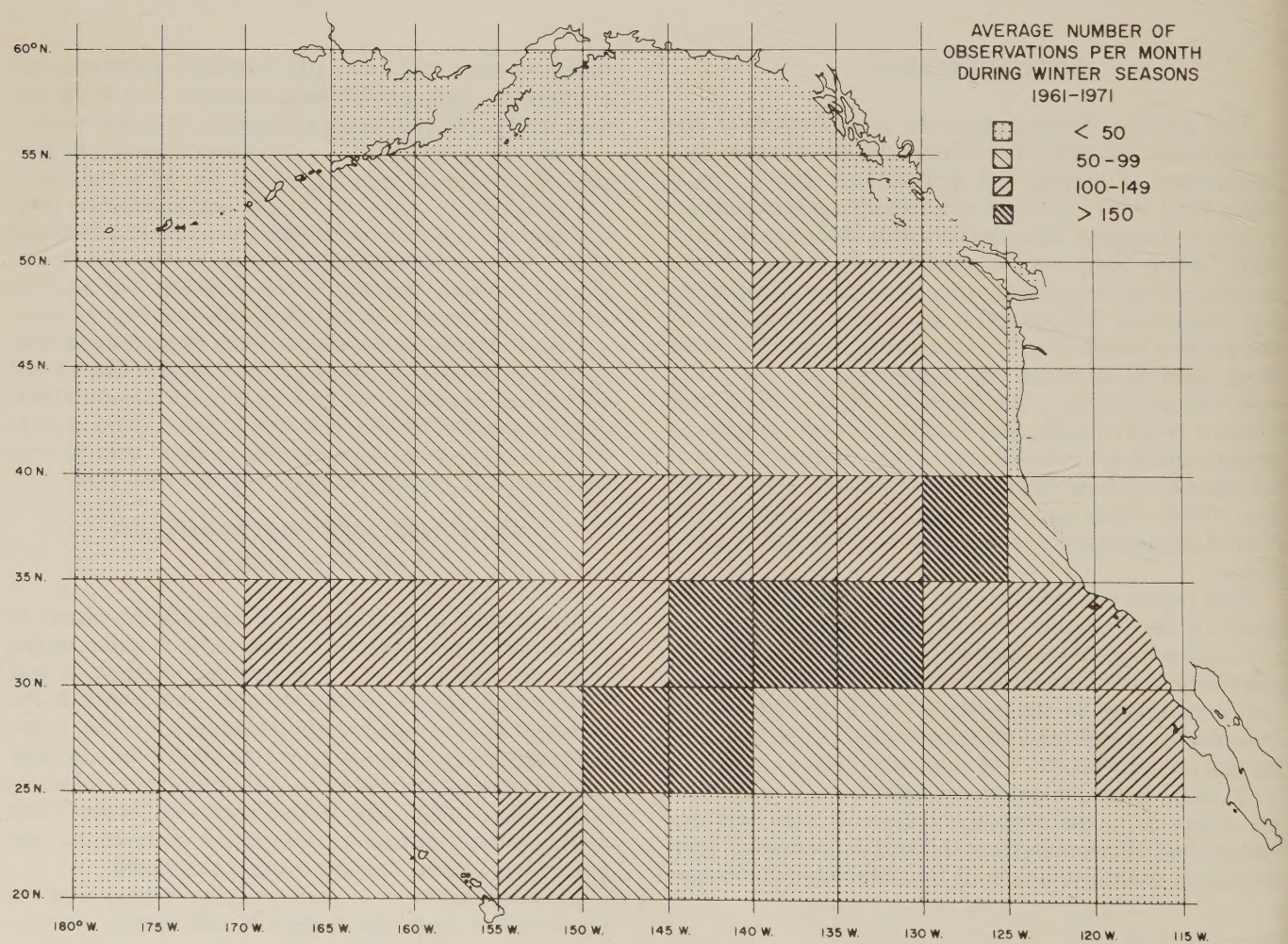

Figure 1a.—Average number of observations per month during winter seasons for 1961-71.

and heat exchange values that are computed from the variables. The initial output format consists of a deck of computer cards which are sorted and reprocessed in order to display the values in a geographic format. Each of the variables and heat exchange terms (described below) is printed in this format after three summaries have been made: 1) long-term mean monthly values computed over the years 1961-71; 2) monthly mean values computed for a given month and year; and 3) deviations of a value for a given month and year from the long-term monthly mean, i.e., anomaly values.

Heat Exchange Computations

For a given area and time period, the equation for the energy exchange at the air-sea interface is $Q_t = Q_{io} - Q_r + Q_b + Q_e + Q_s$. Energy exchange calculations presented here do not take into account changes in heat brought about by advection.

Q_{io}, the incoming solar radiation corrected for cloud cover (cal/cm^2/day), is determined from the following equation proposed by Berliand (1960):

$$Q_{io} = (\text{Berliand table})\,(1 - aC - bC^2)$$

where C = cloudiness in tenths;
b = 0.38; and
a = a function of latitude.

Berliand's table, which lists values by month and latitude of incoming solar radiation with a clear sky, and values of "a" are given in Johnson et al. (1965).

Of the incoming radiation corrected for the screening effects of cloud cover, some is reflected at the sea surface. The amount reflected depends on the latitude and time of year and is computed from

$$Q_r = Q_{io} \cdot r$$

where r = percentage of radiation reflected given in a table by Budyko (1956). The percentage varies from about 6% in low latitudes to more than 20% in high latitudes in winter. In preparing the charts, Q_{io} and Q_r were combined in a single term Q_i, the incoming radiation corrected for cloud cover and reflection, defined by $Q_i = Q_{io} - Q_r$.

Effective back radiation, Q_b (cal/cm^2/day), is the difference between long-wave radiation from the sea surface and long-wave radiation from the atmosphere. The following semiempirical equation proposed by

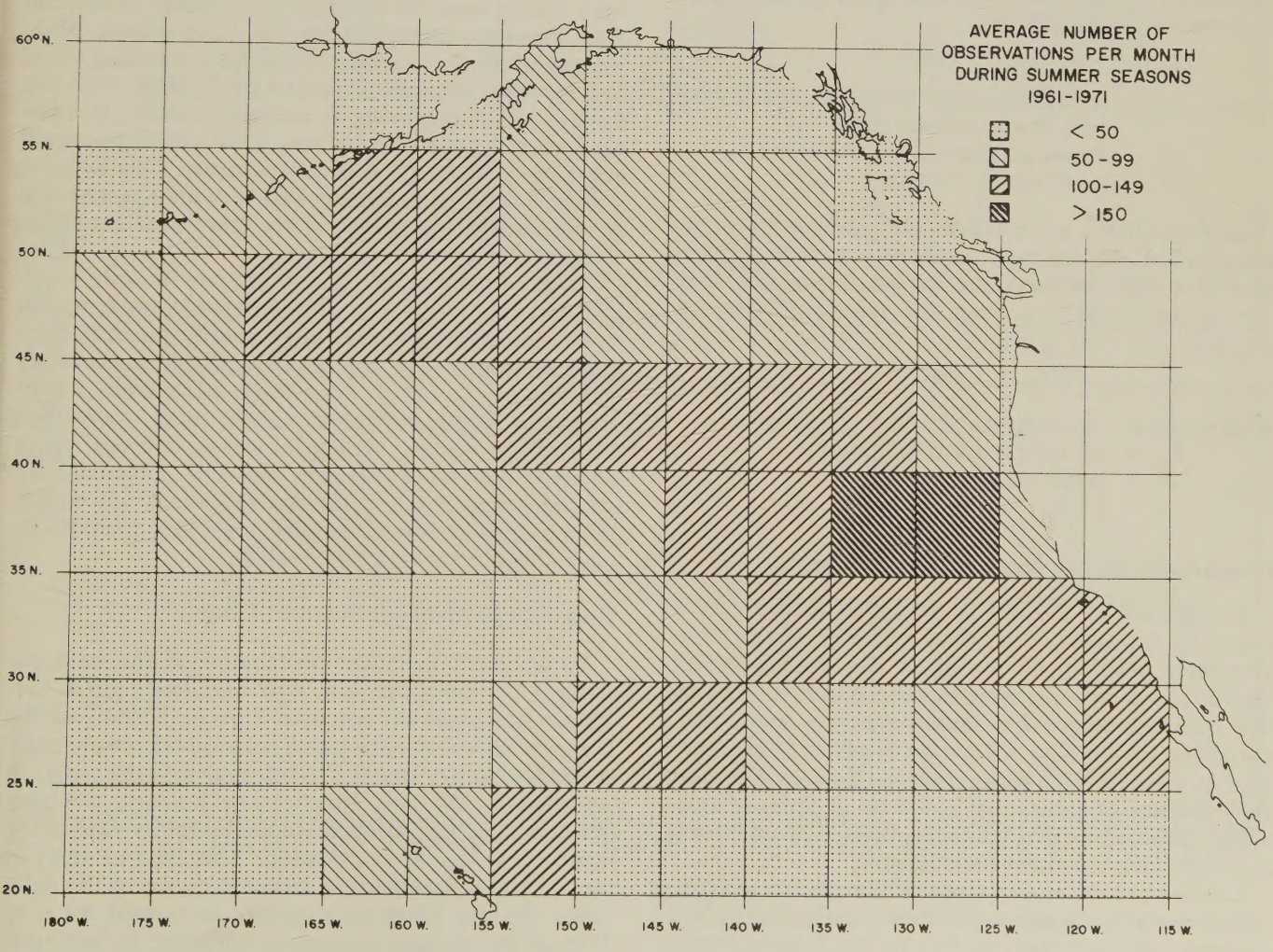

Figure 1b.—Average number of observations per month during summer seasons for 1961-71.

Berliand and Berliand (1952) has been used in this study:

$$Q_b = -\left[s\sigma(\theta_s)^4(0.39 - 0.050\sqrt{e_a})(1 - kC^2) + 4s\sigma\theta_s^3(\theta_s - \theta_a)\right]$$

where s = 0.97 (the ratio of the radiation of the sea surface to a black body);
θ_s = absolute sea surface temperature (°K);
θ_a = absolute air temperature (°K);
σ = 1.175×10^{-7} (the Stefan-Boltzmann constant);
e_a = vapor pressure (mb);
k = a function of latitude (values given in Johnson et al., 1965);
C = cloudiness in tenths of celestial dome covered.

Additional energy enters or leaves the sea surface as evaporation (Q_e) and sensible heat (Q_s). Evaporation depends upon 1) the velocity of the wind and the vapor pressure difference between the sea surface and air above it, and 2) a coefficient of proportionality. The coefficient of proportionality used in our computations is given by Tabata (1958):

$$Q_e = -4.70\,(e_s - e_a)W$$

where e_s = saturation vapor pressure at temperature of sea surface (mb);
e_a = vapor pressure of air (mb); and
W = wind speed (m/sec).

Bowen (1926) established the relation between evaporation and the heat conduction at a water surface. The equation used here for sensible heat loss by the ocean is derived from the relation found by Bowen:

$$Q_s = -3(T_s - T_a)W$$

where T_s = sea temperature (°C);
T_a = air temperature (°C); and
W = wind speed (m/sec).

Preparation of the Heat Exchange Charts

Preparation of the charts presented in this report began by transferring the heat exchange values from computer printouts to a map of the eastern North Pacific and then contouring them by hand. In drawing the isolines, subjective smoothing was used, and, therefore, the lines do not always conform to the numbers as printed. This technique was used to eliminate the influence of values that could be an order of magnitude different from surrounding ones, a problem that is usually due to observation errors.

Caution should be exercised in interpreting the individual energy exchange values in regions having limited observational coverage (see Fig. 1a, 1b). Small errors in observation and transmission can cause large errors in some of the computations. In quadrangles having few observations, considerable bias can be introduced by the relative positions of the reporting ships and their timing with respect to the calendar month. All computations presented assume the data centroid to be at the center of each respective quadrangle and for the middle of the month. Energy exchange calculations were not made for 5° quadrangles having fewer than five observations per month.

CHARTS PREPARED FROM THE HEAT EXCHANGE COMPUTATIONS

Monthly Average and Anomaly Charts

Monthly averages and anomalies of the total (net) heat exchange, Q_t, across the air-sea interface are shown for each month of the 11-yr period, 1961-71, in Part 1 of the chart section. A detailed description of these charts will not be given since readers can draw their own conclusions depending upon the intended use of the charts. However, some remarks will be made concerning spatial characteristics and magnitudes of the Q_t anomaly patterns.

The anomaly patterns of total heat exchange Q_t vary widely over the chart for a particular month and from month-to-month during the 11-yr period. Magnitudes of the Q_t anomalies range from less than 1% of the monthly average values to over 200%, with the largest values occurring in summer months. In addition, there appears to be very little month-to-month persistence in the Q_t anomaly patterns. This result is not surprising, since there is also very little persistence in the anomaly patterns of the four heat exchange terms that determine Q_t.

Since anomalies of Q_i and Q_b are usually small compared to those of Q_e and Q_s, spatial and temporal variations in Q_t anomalies are primarily due to fluctuations of evaporative and sensible heat flux. Anomaly patterns of Q_e and Q_s tend to be fairly large in geographical scope and coherence; at times, more than 50% of the eastern North Pacific is covered by an anomaly pattern of the same sign and magnitude. In addition, magnitudes of the anomalies can vary widely from month-to-month, ranging from less than 1% to over 100% of the monthly average.

Long-Term Mean or Normal Charts

In order to facilitate description of the heat exchange normals, the first two harmonics (first harmonic has a period equal to 1 yr or 12 mo) of the Fourier Series for each heat exchange term were computed for each of the 93 5° quadrangles on the chart. In addition to the two Fourier coefficients, the percentage of series variance accounted for by each of the harmonics was also computed. This type of analysis was useful in interpreting seasonal cycles of the data, since the two harmonics usually accounted for over 95% of the variance in each quadrangle; in fact, over most areas of the chart the first harmonic or yearly cycle accounted for over 90% of the variance. By de-

termining the phase of the harmonics, it was also possible to compare relative times of maximum and minimum values of each series.

Part 2 of the chart section shows the long-term mean monthly values (normals) of the total heat flux across the air-sea interface, $\overline{Q}_t$. Negative values of $\overline{Q}_t$, implying heat loss from the ocean surface, occur from September through March, while positive values, implying heat gain by the surface layer, occur from March through September. A regular yearly cycle is found in the $\overline{Q}_t$ series with maximum values occurring in June and minimum values in December.

Part 3 of the chart section shows the normal values of net incoming solar radiation, $\overline{Q}_i$. As expected, a regular yearly cycle is found in the $\overline{Q}_i$ series with maximum values in each quadrangle occurring in June and minimum values in December due to the motion of the earth around the sun and the tilt of the earth's axis of rotation with respect to the plane of revolution.

Part 4 of the chart section shows the effective back radiation, $\overline{Q}_b$. A regular yearly cycle is also found in the $\overline{Q}_b$ series. Maximum values occur in December and January due to the relatively low values of air vapor pressure and large values of sea-air temperature differences during these months, while minimum values occur in June and July.

Part 5 of the chart section shows the normal values of evaporative heat transfer between ocean and atmosphere, $\overline{Q}_e$. A pronounced yearly cycle is found in the $\overline{Q}_e$ series with maximum values occurring in December and minimum values in June. Negative values of $\overline{Q}_e$ occur in all months, reflecting the fact that on the average sea-air vapor pressure differences are positive throughout the year.

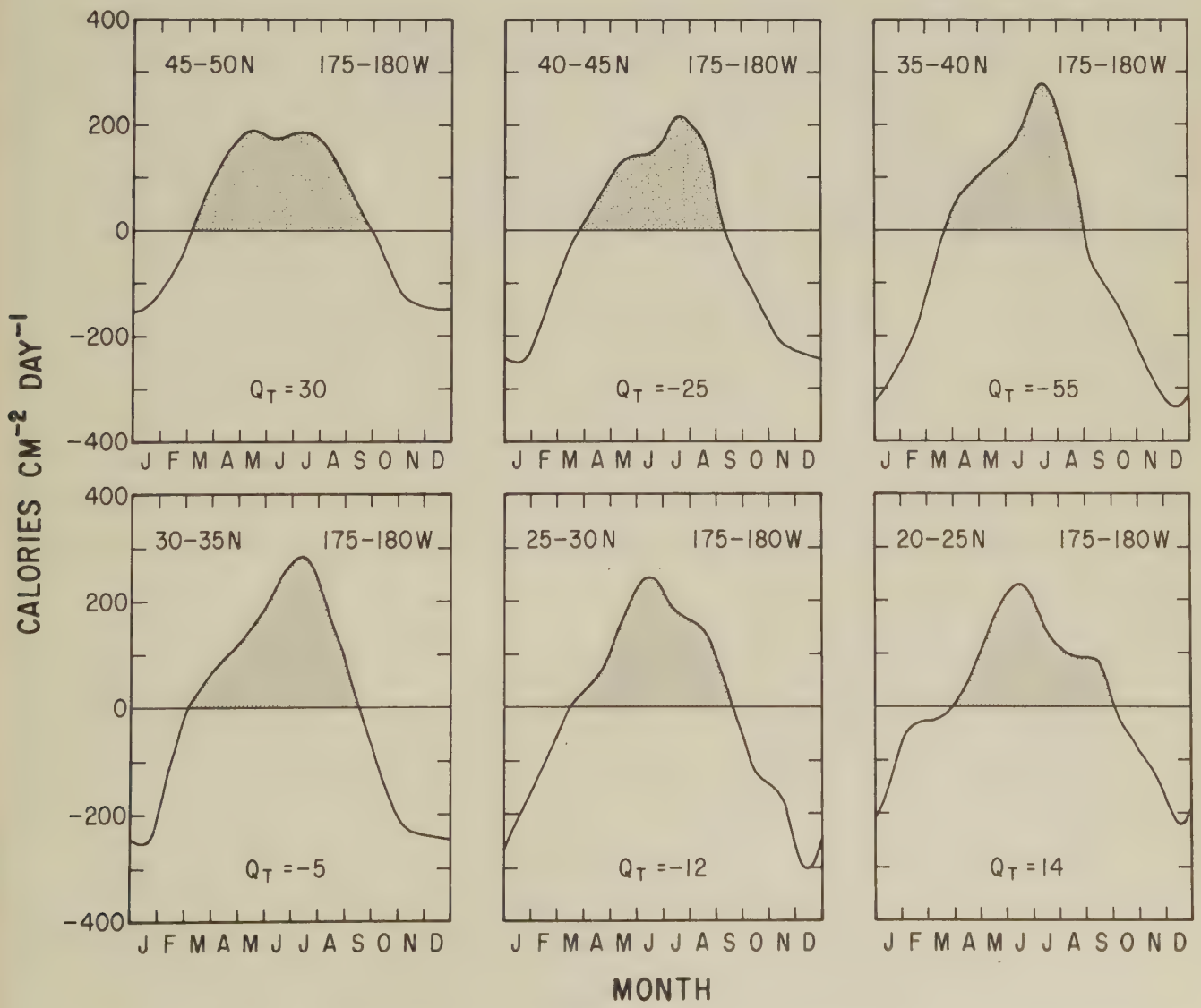

Plate 1.—Seasonal variation of average monthly total heat exchange, $\overline{Q}_t$, by 5° quadrangles from lat. 20° to 50°N in the meridional strip long. 175°W to the 180° meridian. Q_T is the average annual total heat exchange.

Part 6 of the chart section shows the normal values of sensible heat transfer between ocean and atmosphere, $\overline{Q}_S$. A regular yearly cycle is also found in the $\overline{Q}_S$ series with maximum values occurring in November and December and minimum values in May and June. Positive values of $\overline{Q}_S$ (heat gained by sea surface) occur in high latitudes from April through September, reflecting the fact that air temperatures in this region of the eastern North Pacific are warmer than sea temperatures during these months.

The yearly cycles in $\overline{Q}_e$ and $\overline{Q}_S$ reflect the fact that sea-air temperature and vapor pressure differences and observed wind speeds also have regular yearly cycles with maxima and minima that occur at the same times as those of the heat flux terms.

Seasonal Variation of the Normal Total Heat Exchange

The seasonal variation of the 1961-71 normal monthly total heat exchange, $\overline{Q}_t$, was plotted for each 5° quadrangle and the annual average computed from the equation, $Q_T = \frac{1}{12} \sum_{i=1}^{12} \overline{Q}_{ti}$, where i represents the month. Except in the near coastal region of North America, the character of the normal seasonal variation changes less with latitude than with longitude. Therefore, for the oceanic region lat. 20° to 50°N and long. 130°W to 180°, the seasonal curves and the average annual values are shown here for only three selected meridional strips. Plate 1 shows the seasonal variation for each 5° quadrangle in the longitudinal strip between long. 175°W and 180° at the western boundary of the area. Similarly, Plate 2 represents the area between long. 150° and 155°W northward from Hawaii toward Kodiak, and Plate 3 represents the area between long. 130° and

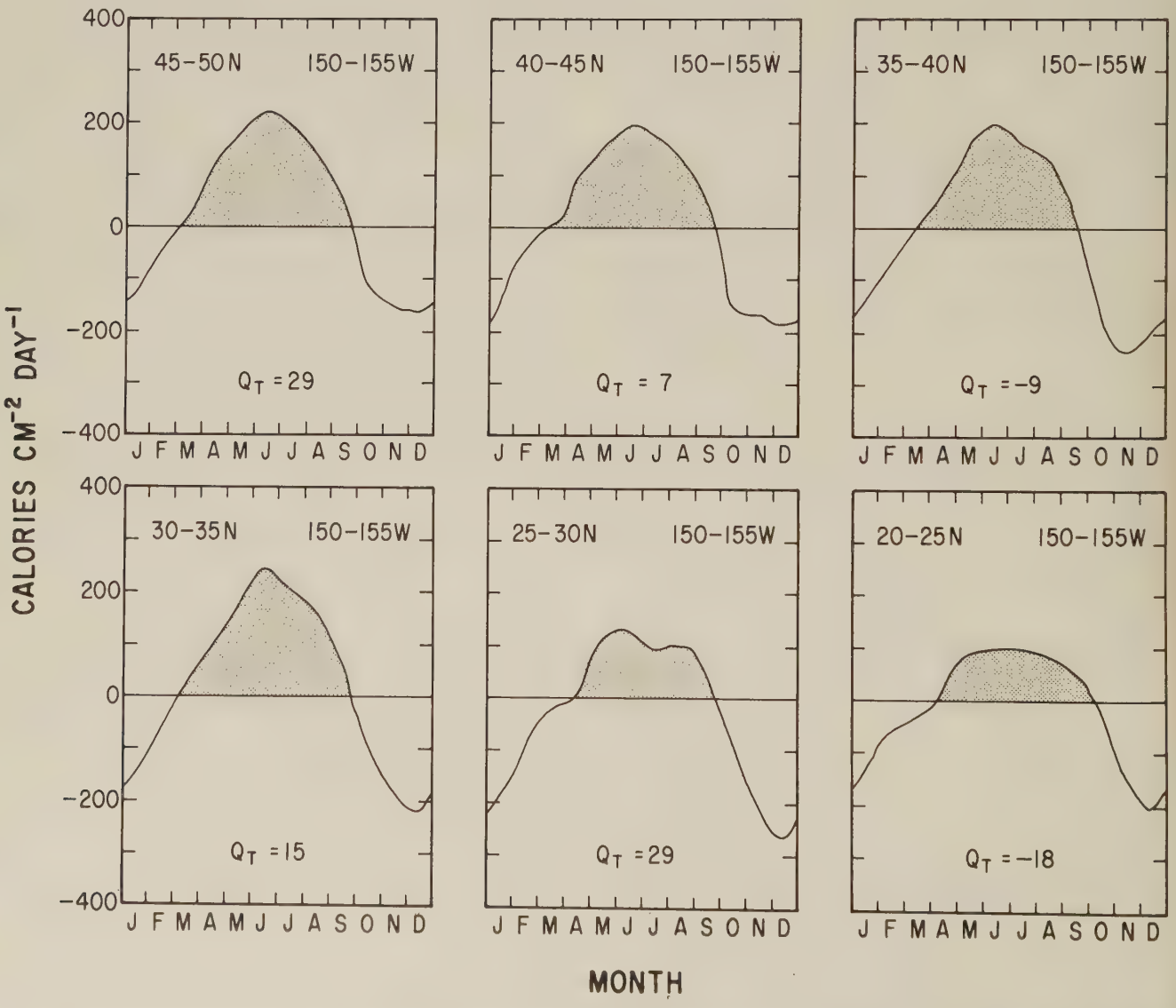

Plate 2.—Seasonal variation of average monthly total heat exchange, $\overline{Q}_t$, by 5° quadrangles from lat. 20° to 50°N in the meridional strip long. 150° to 155°W. Q_T is the average annual total heat exchange.

135°W just westward of the strong influence of the continental boundary. Plates 4 and 5 show the seasonal variation in 5° quadrangles in coastal regions from the northern Gulf of Alaska to Washington and from Oregon to Baja California, respectively.

The general character of the seasonal variations can be described in terms of the average annual net heat exchange, the range of the variations and the months in which the maximum and minimum values occur. In the open ocean, lat. 20° to 50°N and long. 130°W to 180°, the distribution of average annual net heat exchange, Q_T, is highly zonal with the largest (positive) values occurring in the lat. 45° to 50°N band. To the west of long. 155°W a secondary maximum appears in the lat. 30° to 35°N band. The maximum seasonal *range,* nearly 600 cal/cm²/day, occurs in the lat. 35° to 40°N, long. 175°W to 180° quadrangle. The lowest seasonal ranges (205 to 230 cal/cm²/day) occur in the lat. 20° to 25°N band between long. 125° and 145°W. The maximum monthly heat exchange (greatest rate of heat gain by the ocean) occurs in June in all but a few quadrangles where peak gains are in May or July and with the exception of the area from Baja California west to long. 140°W in which August maximums dominate. Minimum values (greatest rate of heat loss from the ocean) generally occur in December except for a few quadrangles with November or January minimums.

In the coastal regions the ranges of the average seasonal variation are consistently large, from about 430 to 525 cal/cm²/day from the Gulf of Alaska to the central California coast. In the northern portion of the section the annual average Q_T is negative. In the absence of declining average annual sea temperatures, a negative annual Q_T implies that heat is transported into the region by currents. Similarly, in the southern region, in the absence of increasing average annual sea

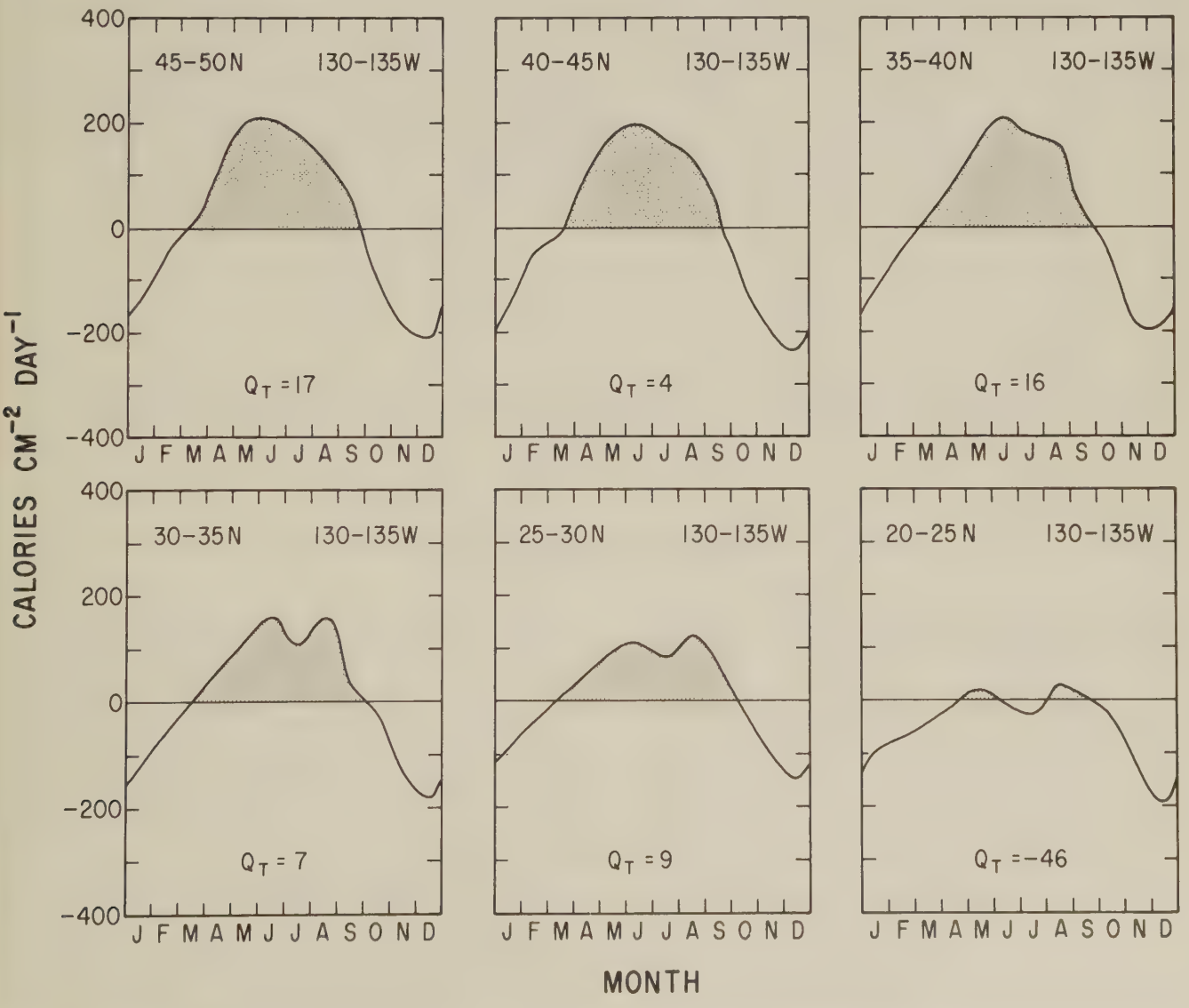

Plate 3.—Seasonal variation of average monthly total heat exchange, $\overline{Q_t}$, by 5° quadrangles from lat. 20° to 50°N in the meridional strip long. 130° to 135°W. Q_T is the average annual total heat exchange.

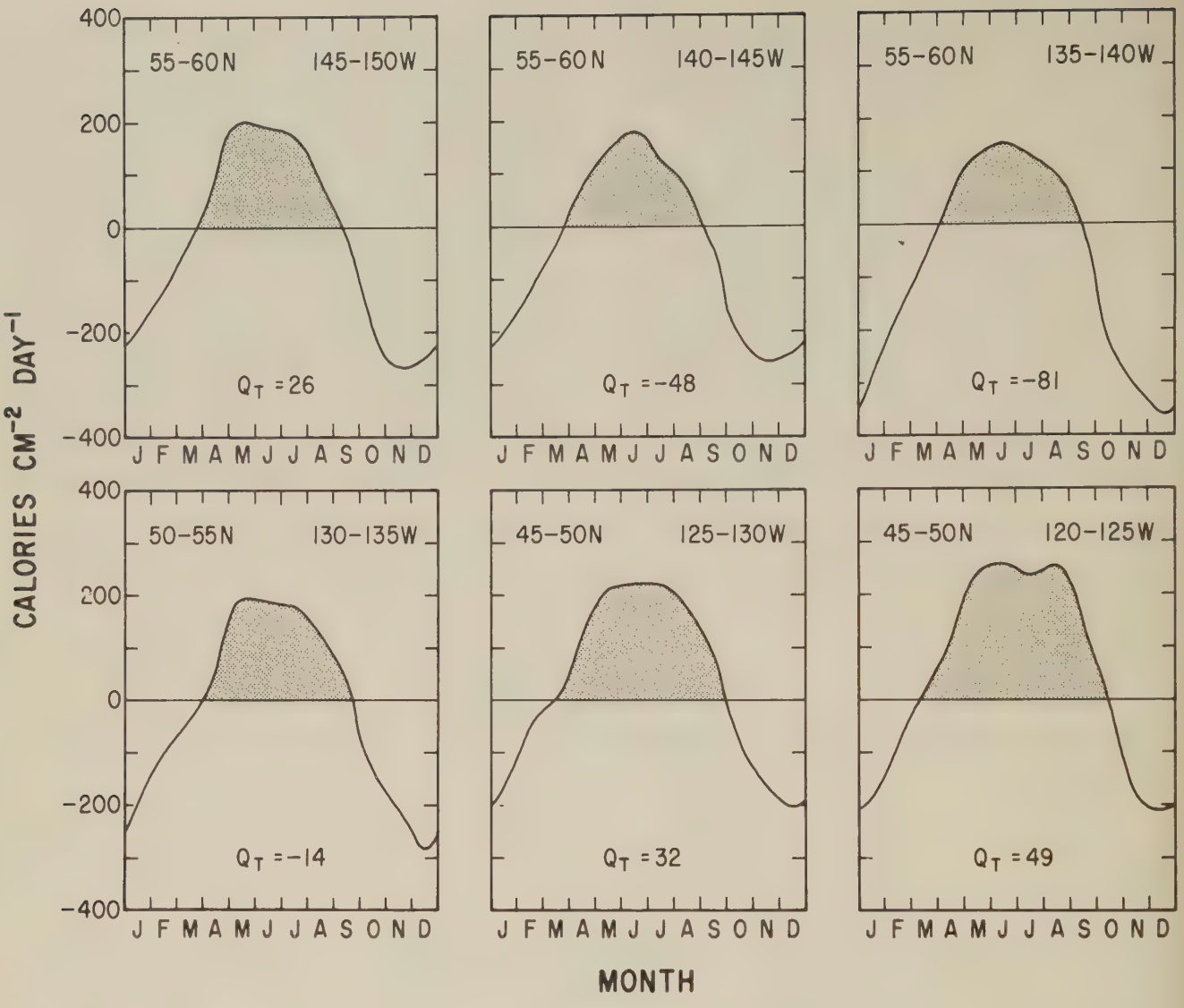

Plate 4.—Seasonal variation of average monthly total heat exchange, $\overline{Q_t}$, in coastal regions from northern Gulf of Alaska to Washington. Q_T is the average annual total heat exchange.

temperatures, a positive annual Q_T implies that heat is extracted from the region by currents.

EVALUATION OF THE CHARTS

The validity of these charts as quantitative representations of heat flux across the sea surface is subject to the quality and geographical coverage of the source data, the accuracy of the empirically derived formulas used for computation and the method of processing. Seckel (1970) has made a thorough analysis of each of these factors in producing a 2-yr series of monthly heat exchange tabulations by 5° quadrangles for the North Pacific trade wind zone. Seckel's tabulations provide an excellent set of heat flux values for comparison with those presented in this report.

Both were based on marine synoptic weather observations as the principal data source. However, for our report we utilized observations radioed ashore, while Seckel's data were derived from written logs archived by the National Weather Records Center.[2] Sets of data acquired by these two methods for particular areas and time periods will be similar but not identical due to card-punching and transmission errors and to the fact that not all data entered in weather logs are transmitted by radio, and not all observations reported by radio reach the archives.

Seckel's method of averaging the observations for each 5° quadrangle and month gave equal weight by 1° quadrangle and by day. These weighted averages of the variables needed for heat exchange computations were plotted on charts at the mean locations of the observa-

[2]Now the National Climatic Center, National Oceanic and Atmospheric Administration.

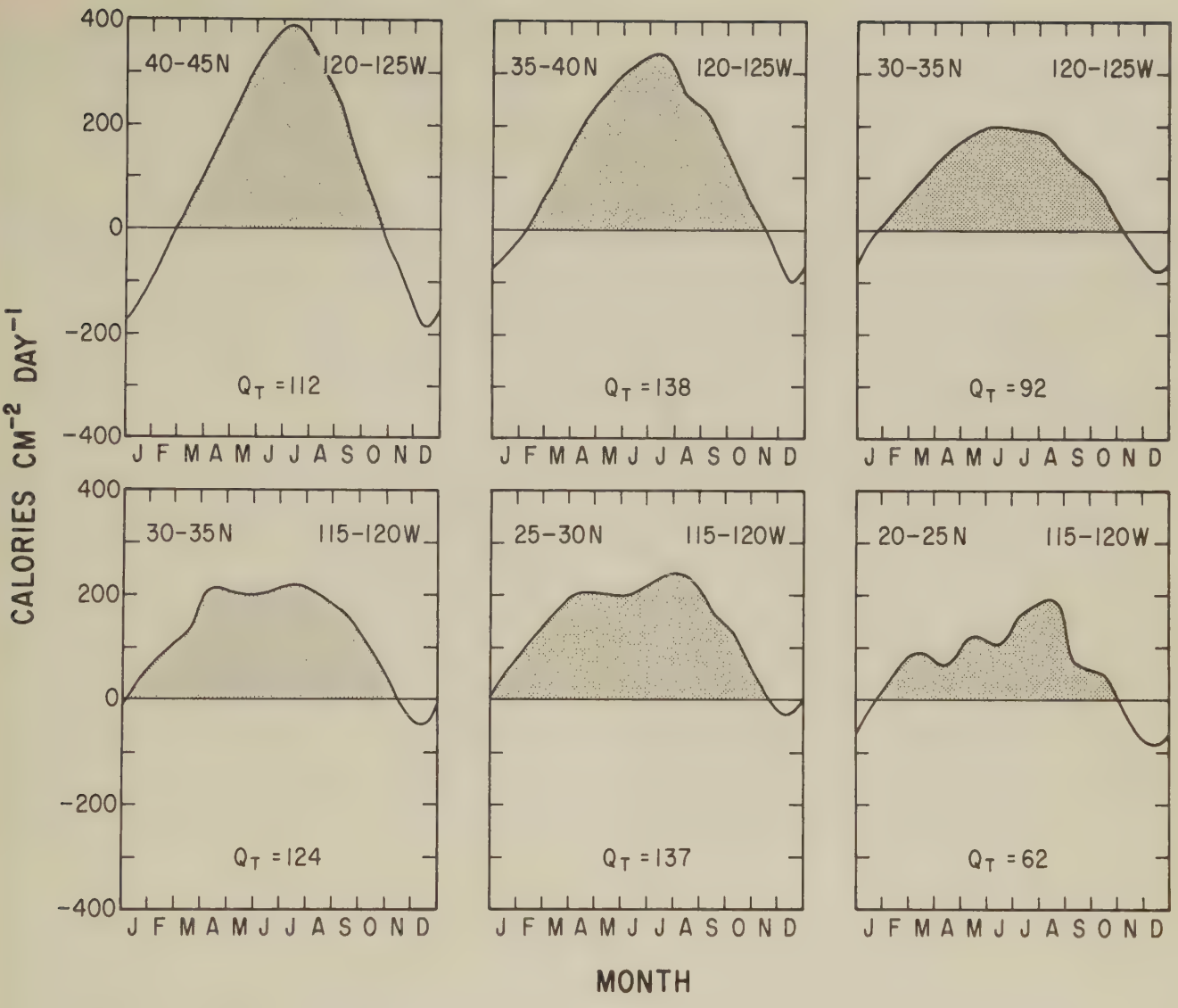

Plate 5.—Seasonal variation of average monthly total heat exchange, $\overline{Q}_t$, in coastal regions from Oregon to Baja California. Q_T is the average annual total heat exchange.

tions. The charts were then contoured and used to obtain values of each variable at the centers of the 5° quadrangles by interpolation.

In the method of Johnson et al. (1965), which was used in the preparation of this report, unweighted averages of the meteorological variables for each 5° quadrangle and month were used to compute the heat exchange components. The refinements employed in Seckel's method improve the accuracy of his results because of the fact that obervations are concentrated along shipping routes and generally are not distributed evenly in either time or space.

The empirical equations used by Seckel to compute the components of heat exchange differ in some respects from those used to obtain the results presented in this report. The greatest difference occurs in the equations for heat loss through evaporation. Seckel used a variable drag coefficient which is formulated as a function of wind speed. His equation would give approximately the same values of evaporation as that of Johnson et al. (1965) at a wind speed of about 7 m/sec.

The equation for incoming radiation employing Berliand's table, used by Johnson et al. (1965), gives higher values of heat flux than the corresponding equation used by Seckel for equivalent conditions. Computed values of sensible heat conduction, on the other hand, would be 25% greater in magnitude using Seckel's equation due to a difference in constants. The equations used for effective back radiation are the same.

In consequence, discrepancies between values of total heat exchange given in this report and those published by Seckel may arise from differences in the empirical equations, from differences in processing techniques and from differences in the observational data

actually used for computation due to different methods of acquisition.

No attempt will be made to make a critical evaluation of these factors, however, a simple comparison of independently computed net heat flux values may be helpful in the utilization of the charts in this report.

The region studied by Seckel overlapped that represented by our charts from long. 130° to 170°W, between lat. 20° and 35°N. This comprises 24 5° quadrangles; consequently, 24 pairs of computed net heat flux values were available for comparison for each of the 24 mo of Seckel's series, which ran from July 1963 through June 1965.

The mean difference and the root mean square (RMS) difference of net heat flux for each 5° quadrangle are given in Table 1.

Positive differences are predominant and indicate that Seckel's values of net heat flux are larger. The RMS differences range from 40 to 106 cal/cm²/day and are generally smallest in areas having the most observations. The RMS difference for the entire sample is 72 cal/cm²/day.

Correlation coefficients were also computed for each 5° quadrangle from paired values of monthly heat flux over the 2-yr period. The results ranged from 0.93 to 0.98 for areas lat. 30° to 35°N, 0.88 to 0.95 for areas lat. 25° to 30°N, and 0.62 to 0.91 for areas lat. 20° to 25°N. Only three quadrangles had a correlation coefficient smaller than 0.86 which reflects the fact that the seasonal cycle of net heat flux, as represented by both sets of computations, is several times larger than the RMS differences. Furthermore, the apparent improvement of correlation with latitude reflects an increase in the seasonal range of heat flux northward from lat. 20° to 35°N. The areas for which the correlations were lowest were also the areas with the least observations.

Averaging over larger areas reduces the effect of random variations which adversely affect the correlation by 5° quadrangles between the two sets of values. Figure 2 shows Seckel's monthly total heat flux averaged for the entire region from long. 130° to 170°W and from lat. 20° to 35°N plotted against corresponding averages from our data. The correlation coefficient for the 24 pairs of monthly averages is 0.99 indicating that the effect of random differences has been essentially eliminated.

Systematic differences, however, are revealed by the regression line which crosses the horizontal axis at 12 cal/cm²/day, indicating that Seckel's formulas and processing technique give higher values of the total heat flux. Also, the slope of the regression line differs from 1.0, indicating another systematic discrepancy that stems, at least in part, from Seckel's use of a drag coefficient which varies with wind speed in the equations for evaporation and sensible heat transfer. His formulation gives higher evaporative heat loss with winds stronger than about 7 m/sec (other factors being equal) than those presented in this report, and lower evaporative heat loss with winds weaker than 7 m/sec.

Wind speed frequencies tallied from tables in Seckel's report indicate that in the region and period

Table 1.--Mean difference (upper value) and RMS difference (in parenthesis) of Q_t in cal/cm^2/day for 5° quadrangles

Long. / Lat.	167° W	162° W	157° W	152° W	147° W	142° W	137° W	132° W
32° N	-34	-30	-16	-14	-1	9	36	30
	(101)	(96)	(63)	(38)	(51)	(54)	(48)	(40)
27° N	2	-3	21	39	26	39	26	9
	(106)	(55)	(79)	(80)	(52)	(69)	(59)	(51)
22° N	66	16	29	-5	-9	20	8	23
	(91)	(73)	(64)	(55)	(63)	(96)	(89)	(93)

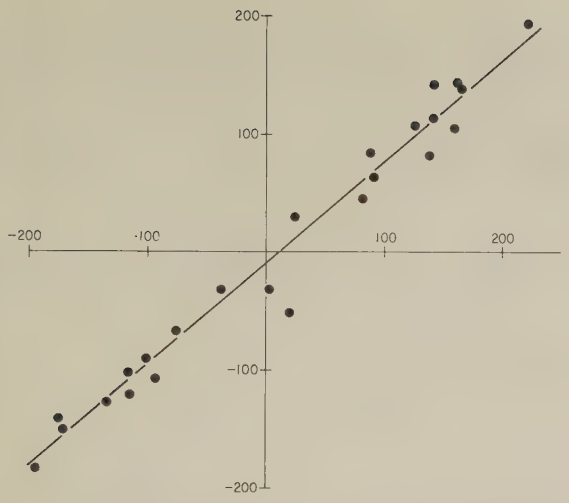

Figure 2.—Comparison of total heat transfer values (cal/cm²/day) taken from Seckel (horizontal axis) and this report (vertical axis). Each of the 24 monthly values for the period July 1963 to June 1965 was averaged over the region lat. 20° to 35°N and long. 130° to 170°W.

for which the comparison was made, wind speeds were less than 7 m/sec in about two-thirds of the cases for June through September and greater than 7 m/sec in about two-thirds of the cases for November through February. These factors combine to make Seckel's computed values of heat loss by evaporation lower than ours in the warming season and greater in the cooling season, which is reflected by his higher maximum and lower minimum values of net heat flux shown in Figure 2.

Computations of heat exchange at the sea surface have also been carried out by Wyrtki (1966) who prepared charts of heat loss by evaporation and of total heat exchange for the Pacific Ocean north of lat. 20°S. Wyrtki's charts are based on marine synoptic weather observations taken during the period 1947-60. The equations used for computation of the various components are equivalent to those described in this report, except for differences in certain empirical constants which give Wyrtki larger values of heat loss by evaporation and conduction under otherwise similar conditions. Wyrtki's method of data processing also differed from that of Johnson et al. (1965). Considering all circumstances, however, results obtained with the equations and procedures of Johnson et al. (1965) for a given set of data would probably agree as well or better with corresponding results from Wyrtki's method than with Seckel's.

Since Wyrtki's charts represent a time period antecedent to the 11 yr covered by our charts, they afford an opportunity to verify climatological patterns of net heat flux and, with caution, to infer changes in such patterns. We will make no attempt at interpretive comparison in this respect, other than to point out a few of the main characteristics in the mean cycle of heat exchange.

The beginning of the cooling season is first evident in September in the northernmost part of the Gulf of Alaska and in an area west of long. 155°W between lat. 35° and 45°N. However, large positive heat flux values still occur at this time of year along the North American coast south of lat. 45°N. By October, the mean net flux is generally negative north of lat. 25°N, except in coastal areas out to about long. 125°W. From October through January, negative heat flux is most intense in the Gulf of Alaska and west of long. 150°W, between lat. 25° and 45°N. Heat loss is minimal between lat. 45° and 50°N west of long. 165°W, and our charts show an area of positive heat flux off southern California and Baja California in every month except December. Wyrtki's charts include all of these features and, in addition, show small areas of positive heat flux even in December. In February, positive values of heat flux appear in coastal areas south of lat. 40°N, out to long. 125°W. The largest negative flux of heat at this time occurs south of lat. 30°N, from long. 165° to 170°W according to Wyrtki's charts and somewhat north and west of that area on our charts.

March is a transition month with marked intensification of positive heat flux south of lat. 40°N from the coast out to long. 125°W, while the flux elsewhere is both positive and negative and generally weak. The principal features in the heat exchange pattern which characterize spring and summer are the areas of maximum positive heat flux along central and northern California and to the west of long. 150°W at lat. 30° to 35°N. Wyrtki also found a relative maximum along the southern stretch of Baja California which does not appear on our charts because of the cutoff east of long. 115°W. A relative minimum in the pattern occurs in the vicinity of long. 130°W at about lat. 20° to 25°N. Our charts show a negative flux in this area in every month except August and September. Wyrtki found negative values in the same area in every month except July and September.

The values of net heat flux computed by Wyrtki differ from those presented in this report by 50 cal/cm²/day or more in many areas. Such differences may reflect dissimilarities in data distribution, methods of processing or real climatological trends. The main features in the mean seasonal patterns of net heat exchange depicted by our charts appear, however, to be well substantiated by comparison with those of Wyrtki.

ACKNOWLEDGMENTS

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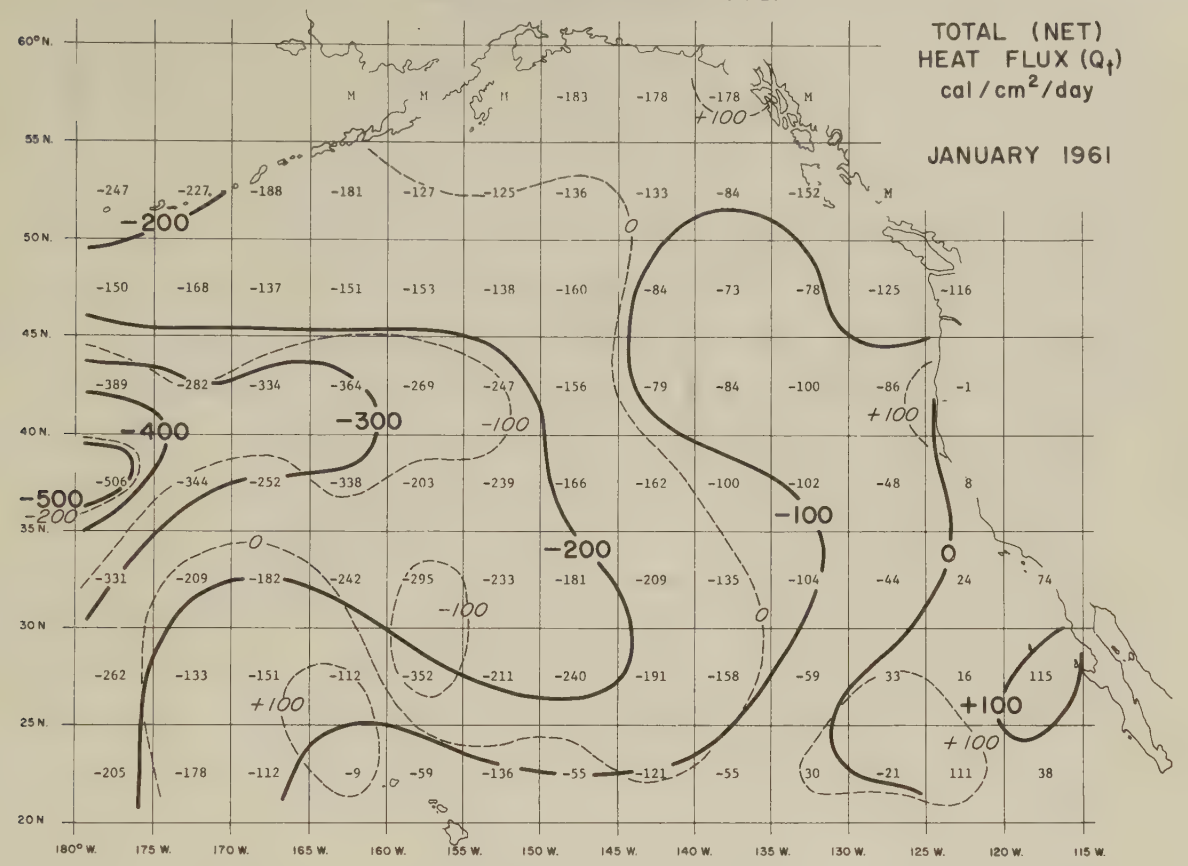
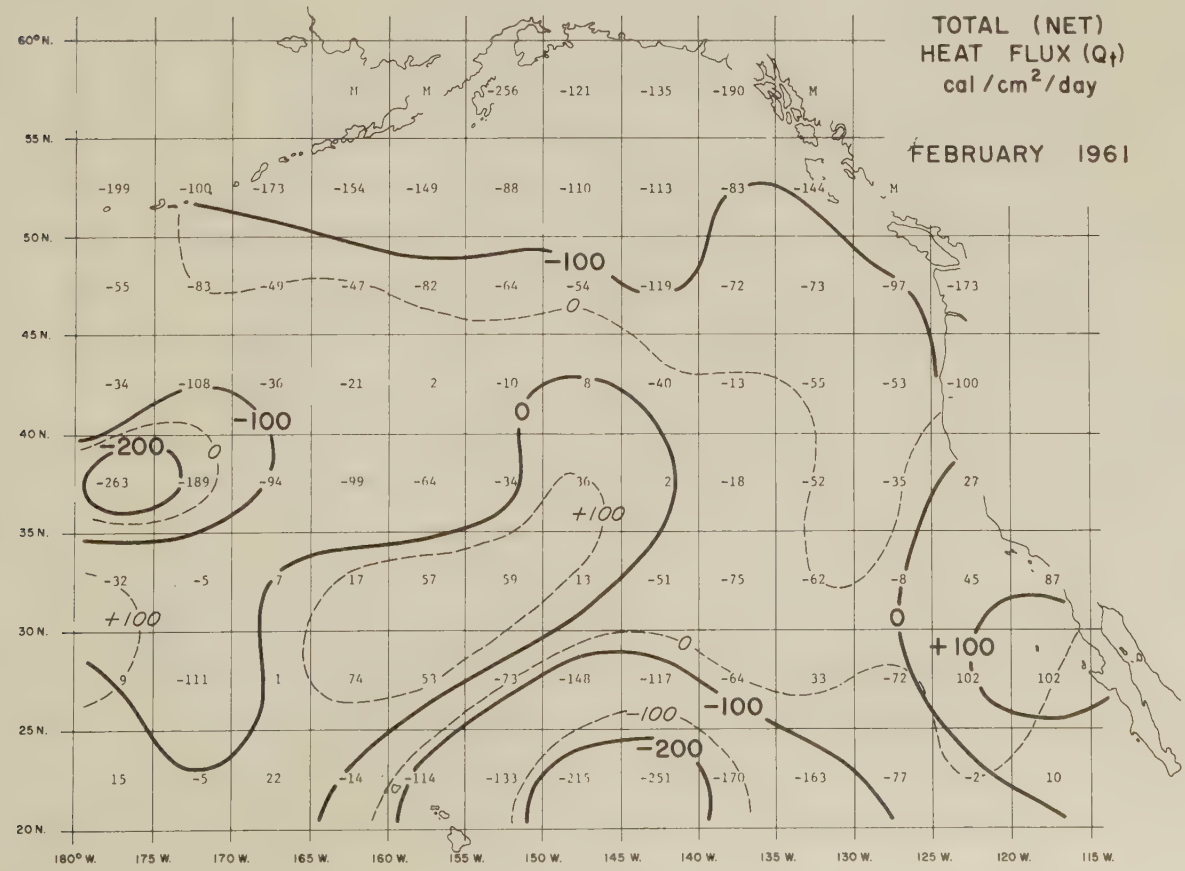
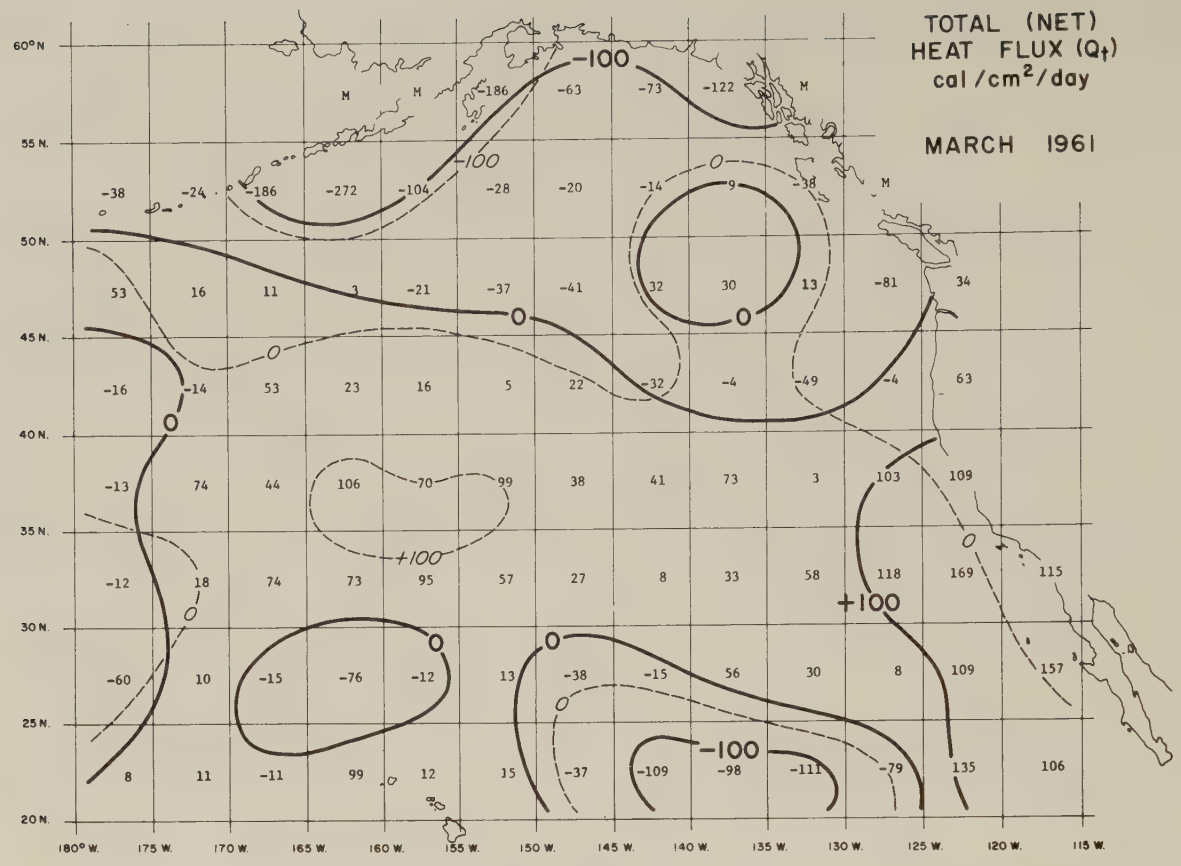
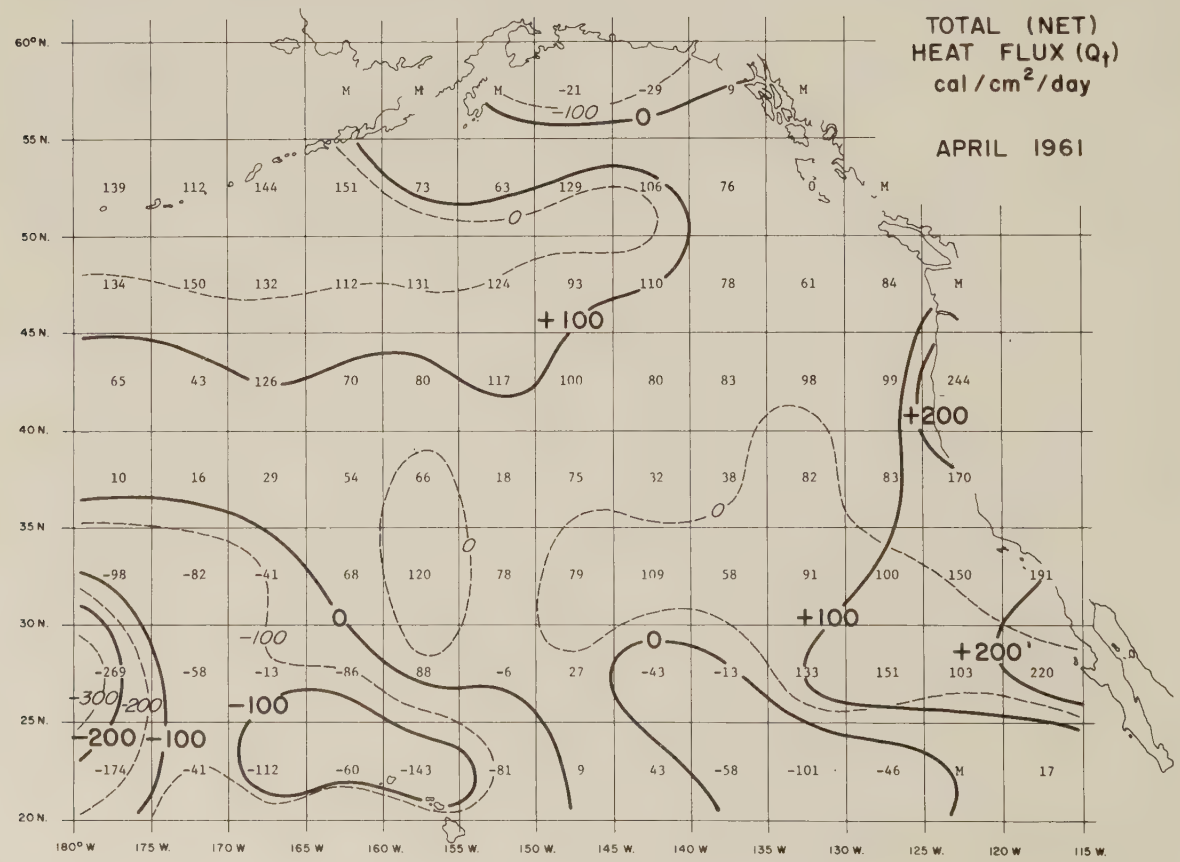
PART 1. TOTAL (NET) HEAT FLUX MONTHLY AVERAGES AND ANOMALIES, JANUARY 1961 TO DECEMBER 1971.






TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
MARCH 1961
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
-100
+100
0


TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
APRIL 1961
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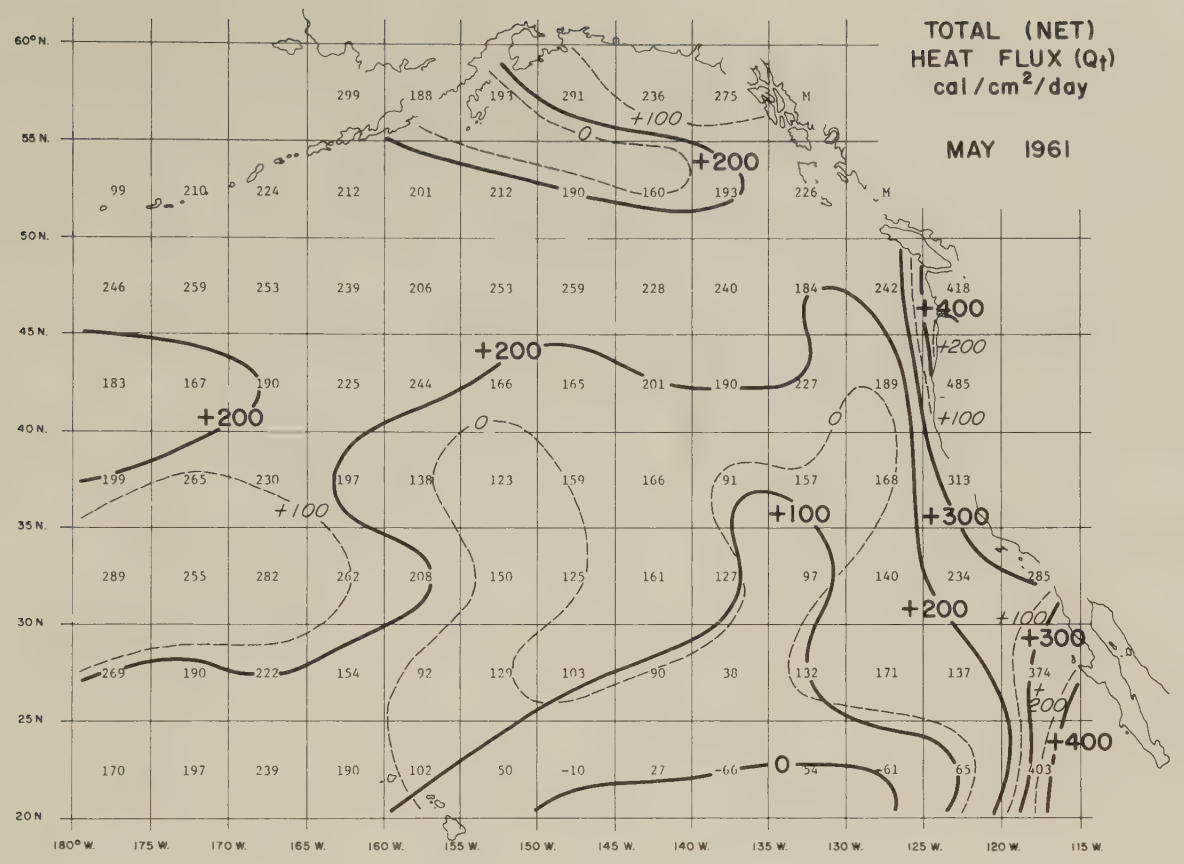
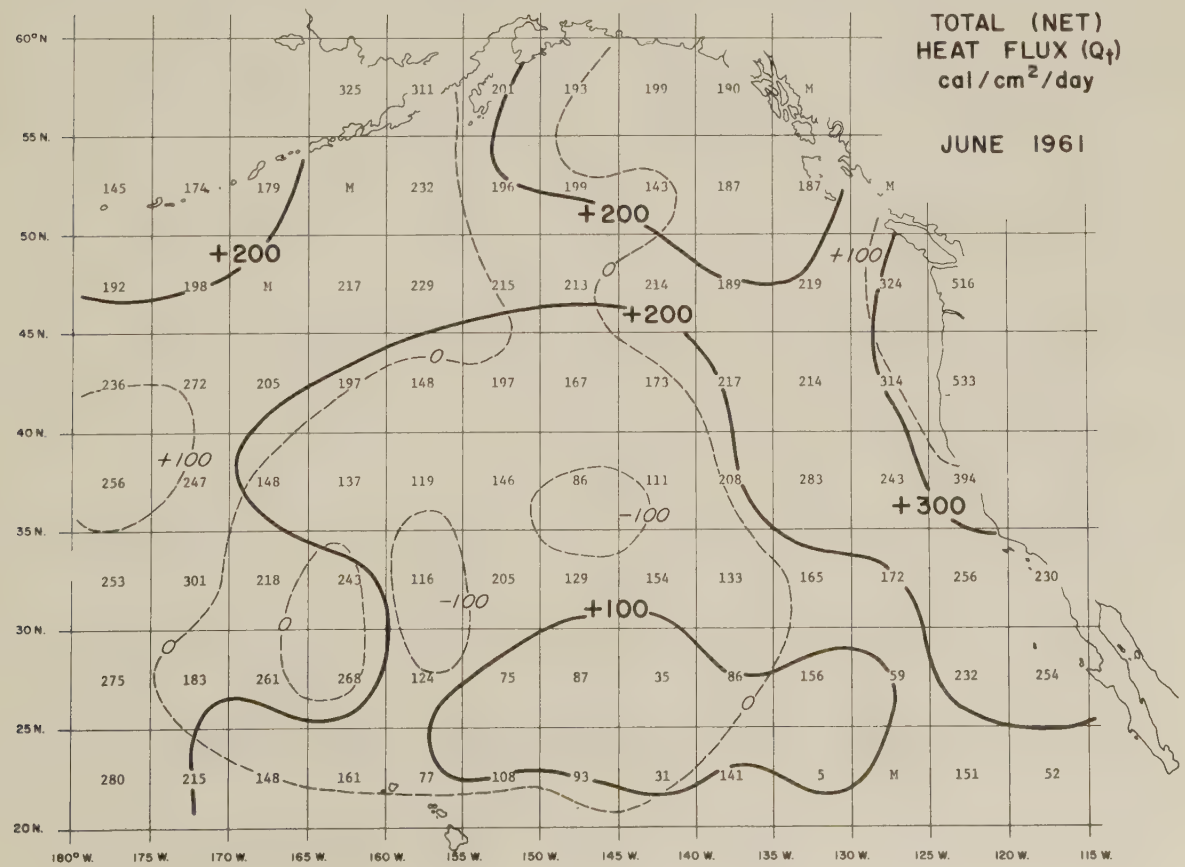
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
-300
-200
-100
0
+100
+200


TOTAL (NET)
HEAT FLUX (Q_t)
cal/cm²/day
MAY 1961
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N
25 N
20 N
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+100
+200
+300
+400
0


TOTAL (NET)
HEAT FLUX (Q_t)
cal/cm²/day
JUNE 1961
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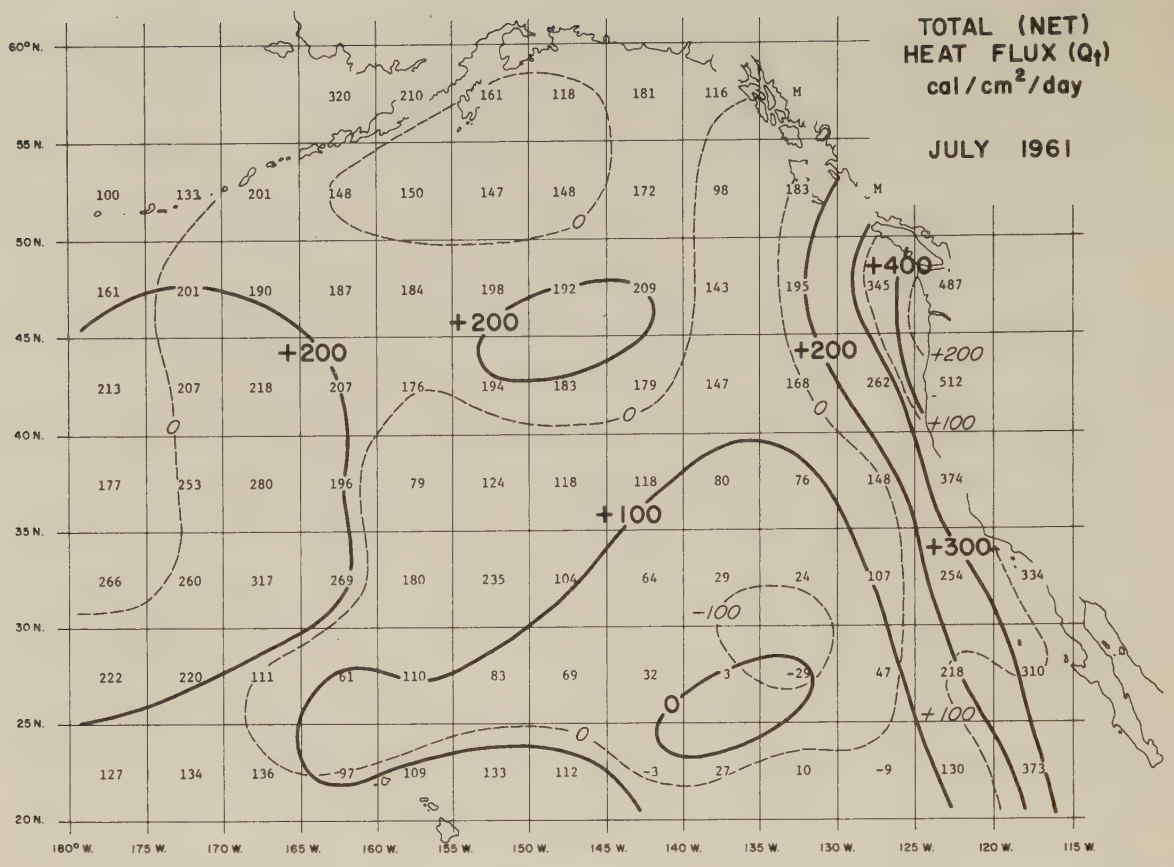
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+100
+200
+300
0
-100


TOTAL (NET)
HEAT FLUX (Q_t)
cal/cm²/day
JULY 1961
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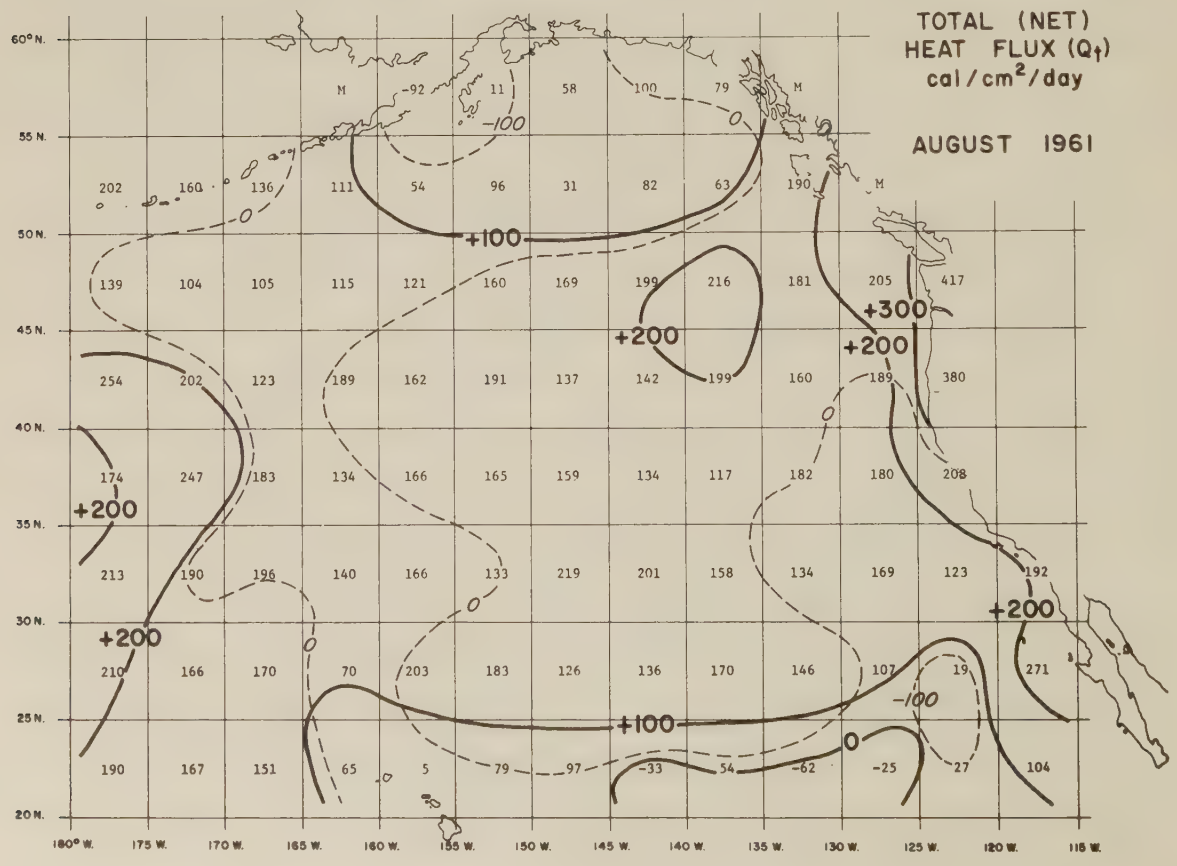
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+400
+200
+100
+300
0
-100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HEAT FLUX (Q_t)
cal/cm²/day
AUGUST 1961
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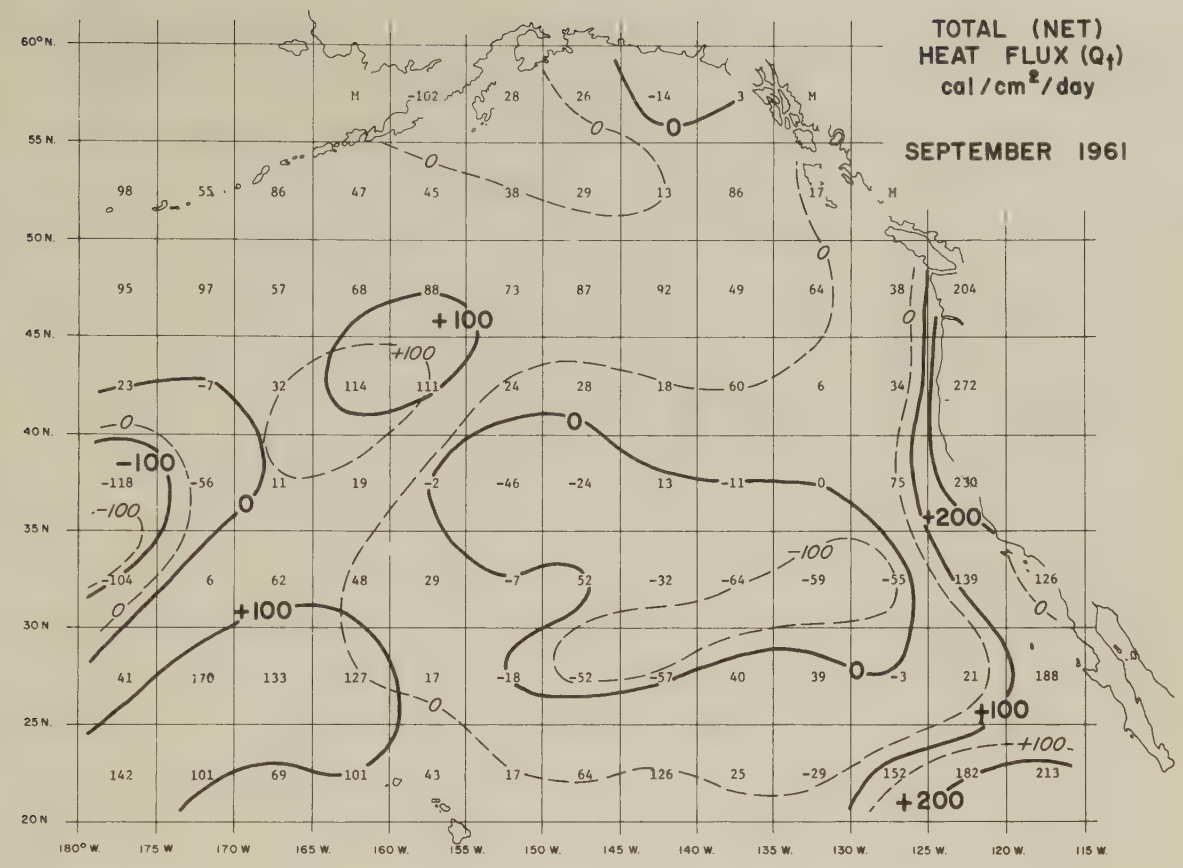
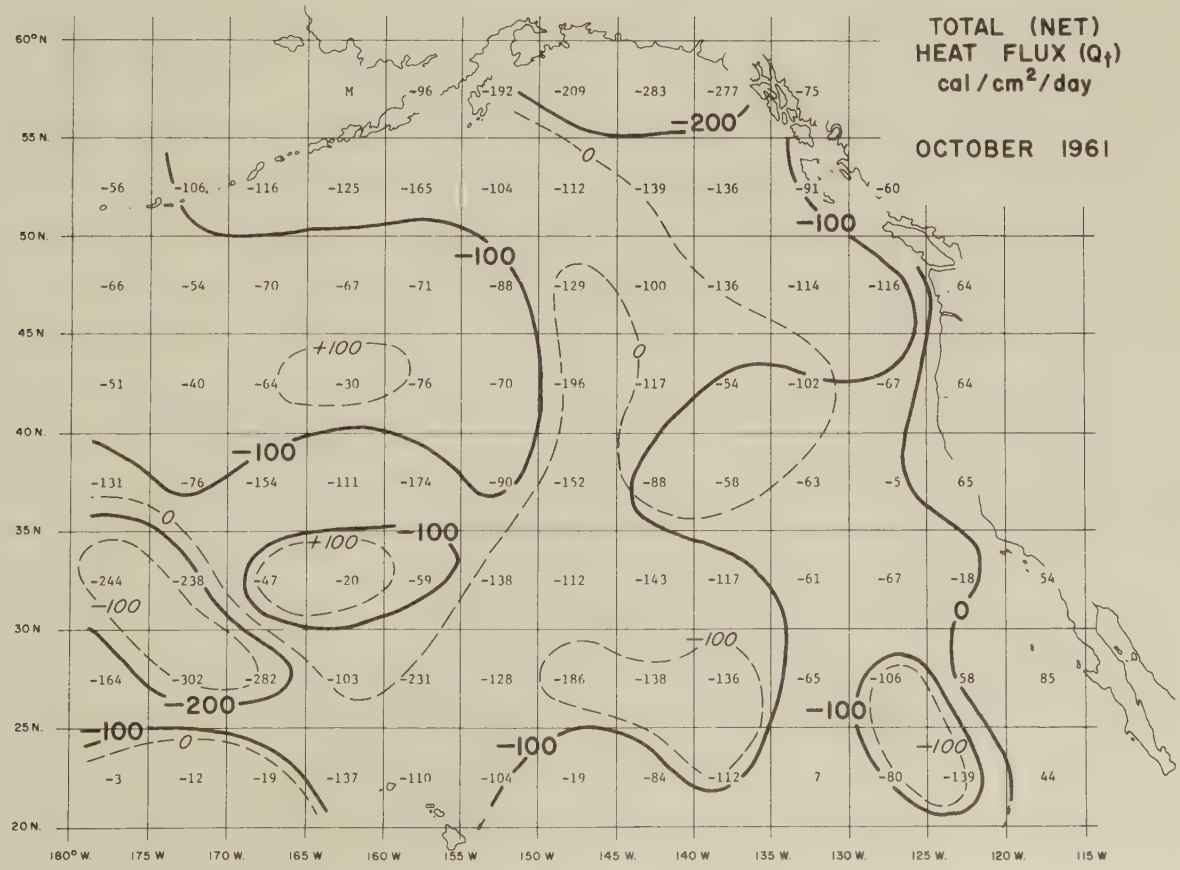
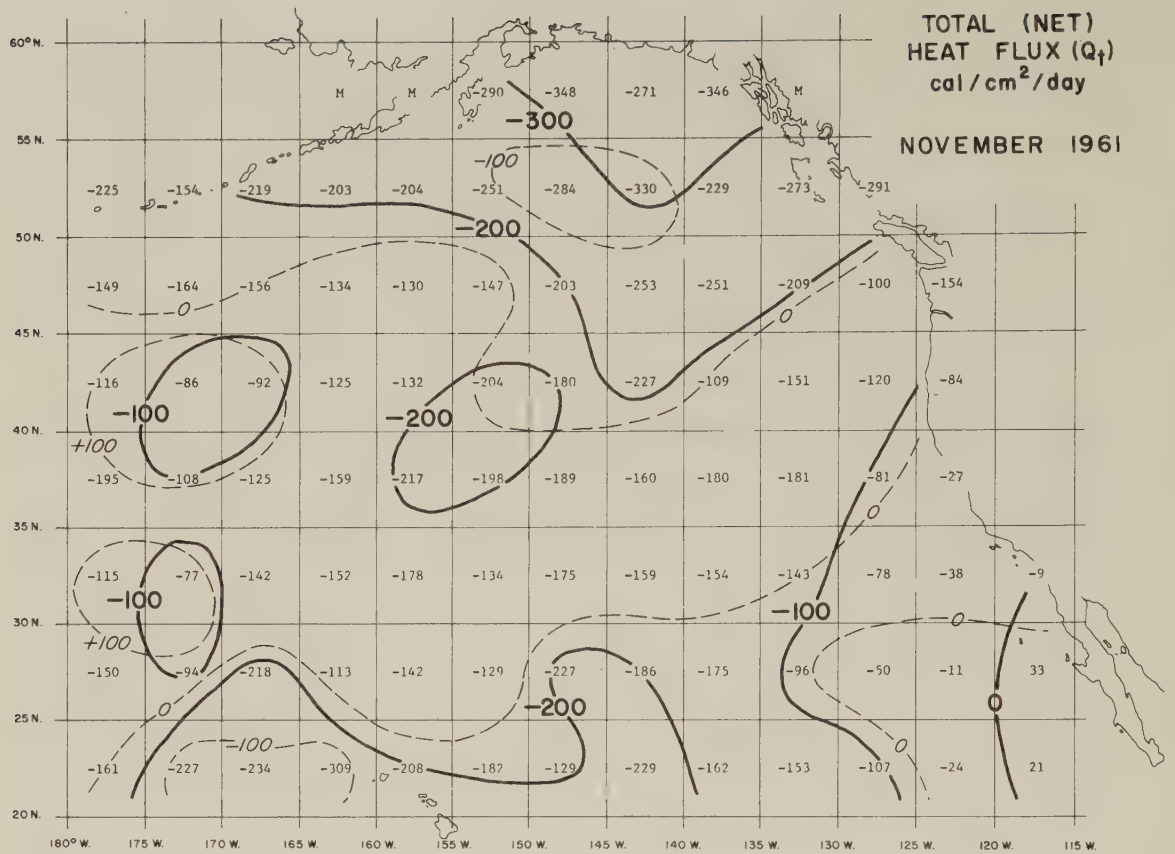
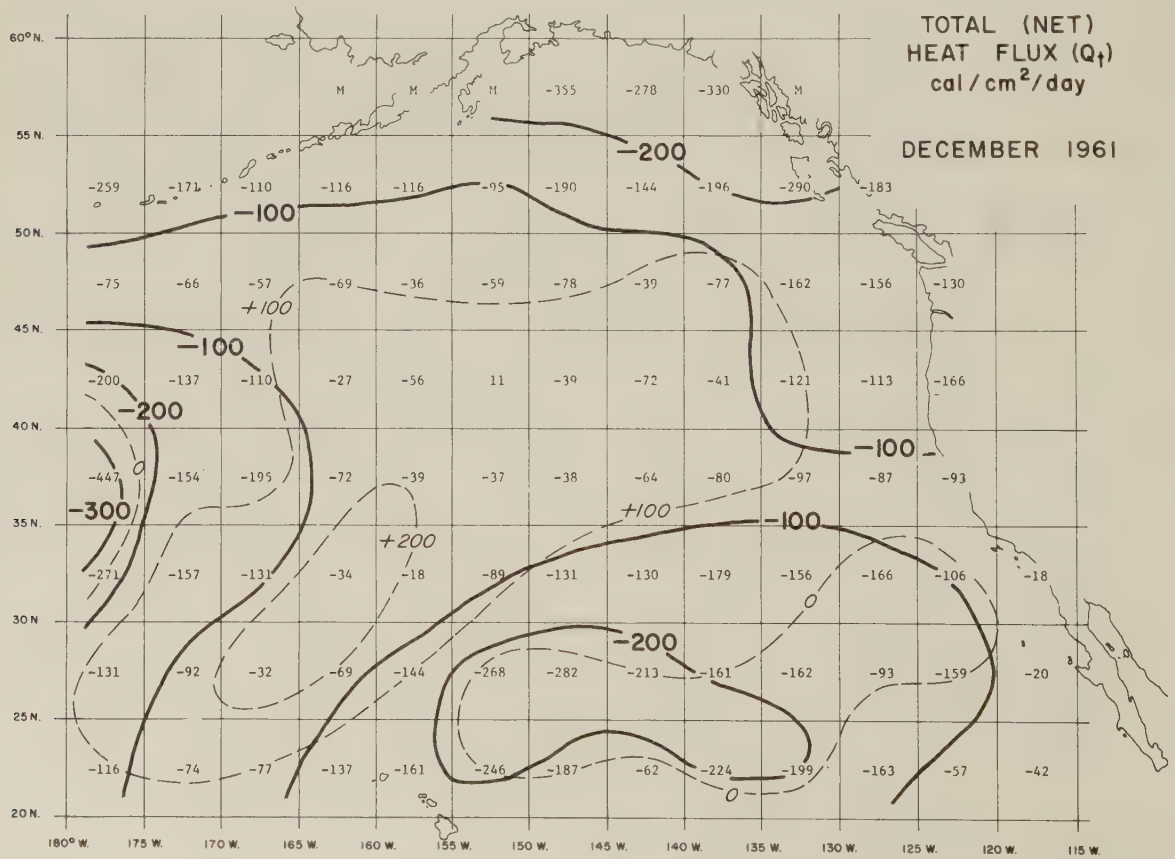
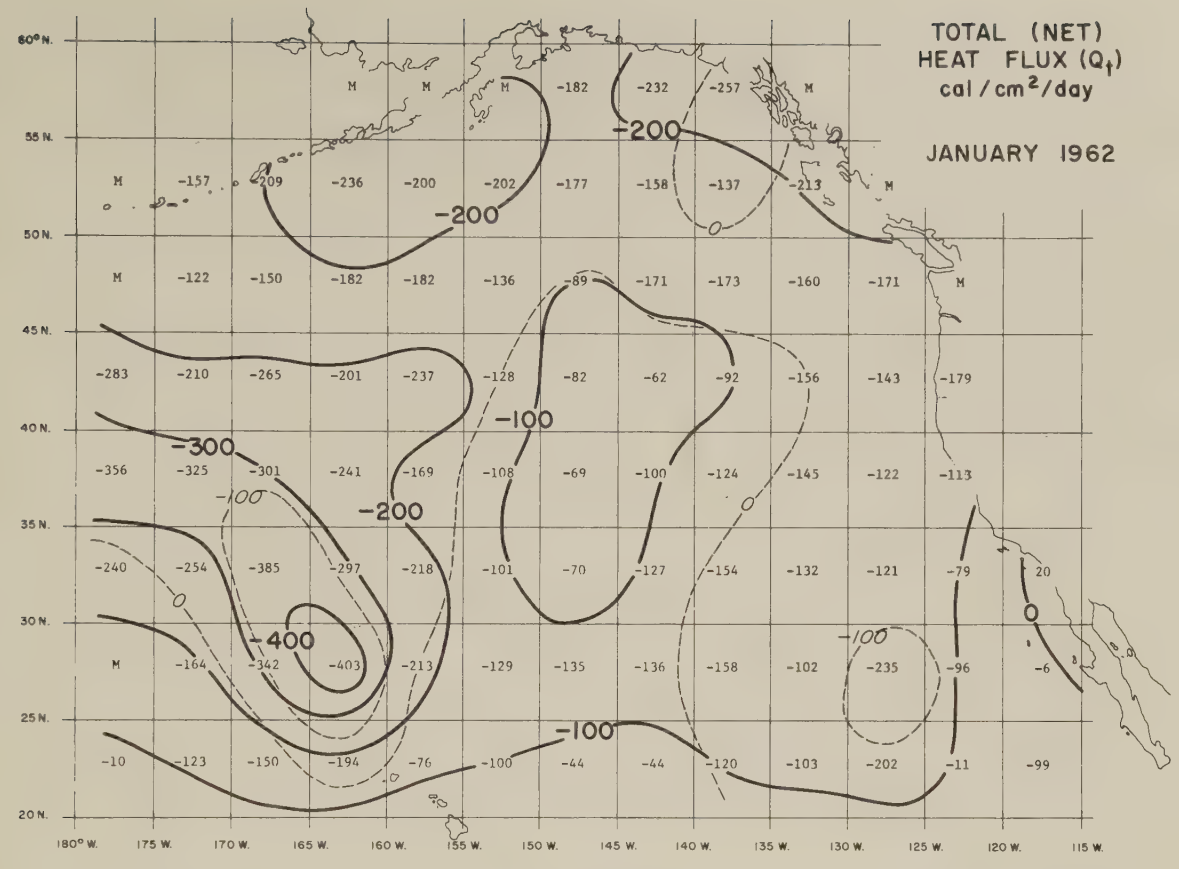
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+300
+200
+100
0
-100


TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm² / day
SEPTEMBER 1961
60° N.
55 N.
50 N.
45 N.
40 N.
35 N
30 N
25 N.
20 N
180° W.
175 W
170 W
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.


TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm² / day
OCTOBER 1961
60°N
55 N.
50 N.
45 N
40 N.
35 N
30 N
25 N.
20 N.
180° W.
175 W
170 W.
165 W
160 W
155 W
150 W.
145 W.
140 W
135 W.
130 W.
125 W.
120 W.
115 W


TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
NOVEMBER 1961
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
-300
-200
-100
0
+100


TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
DECEMBER 1961
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
-300
-200
-100
0
+100
+200


TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2/day
JANUARY 1962
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
-200
-300
-400
-100
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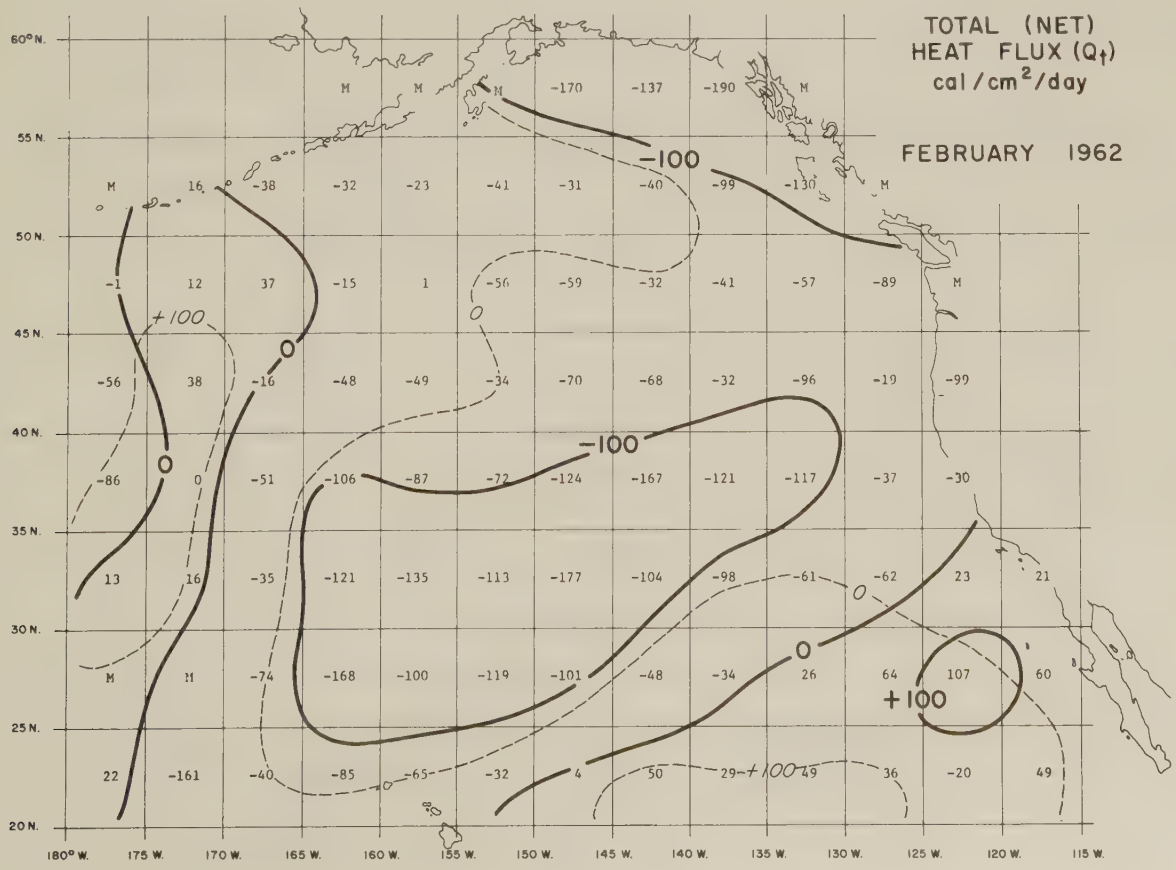
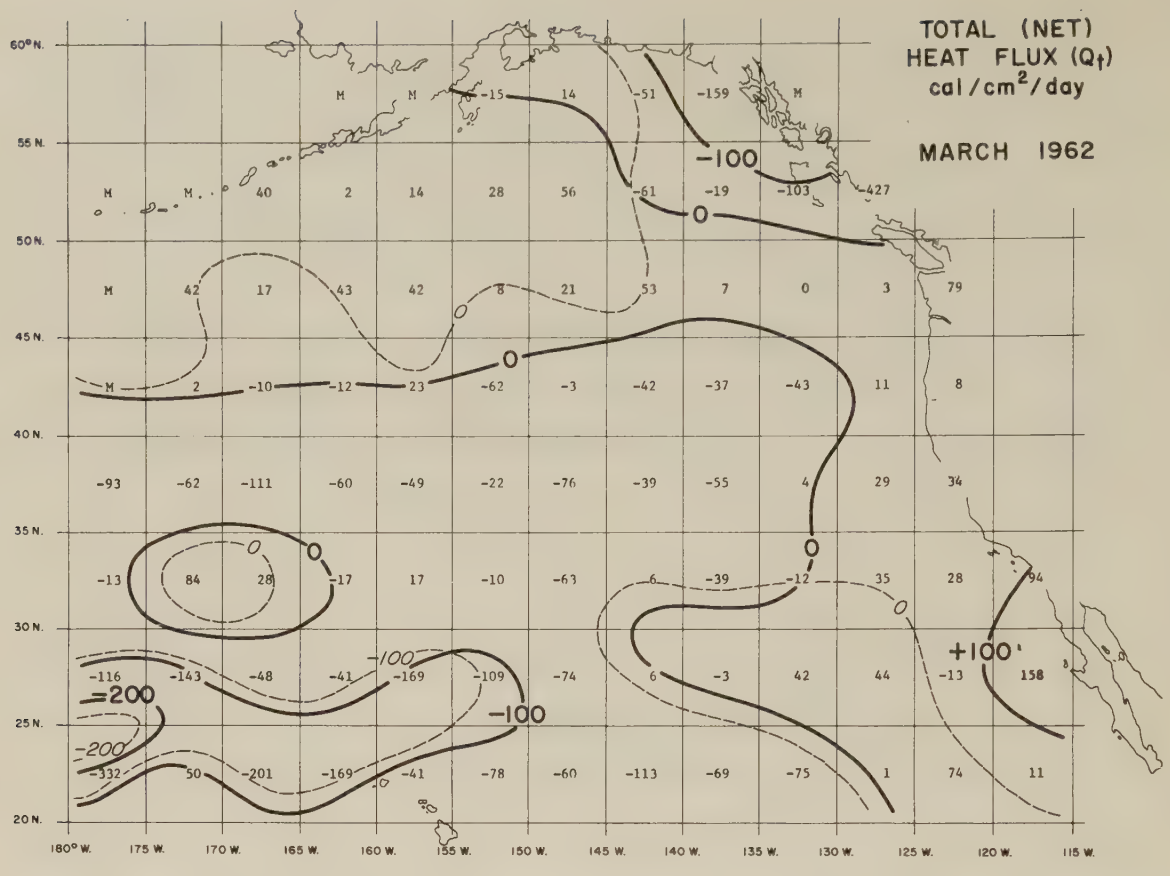
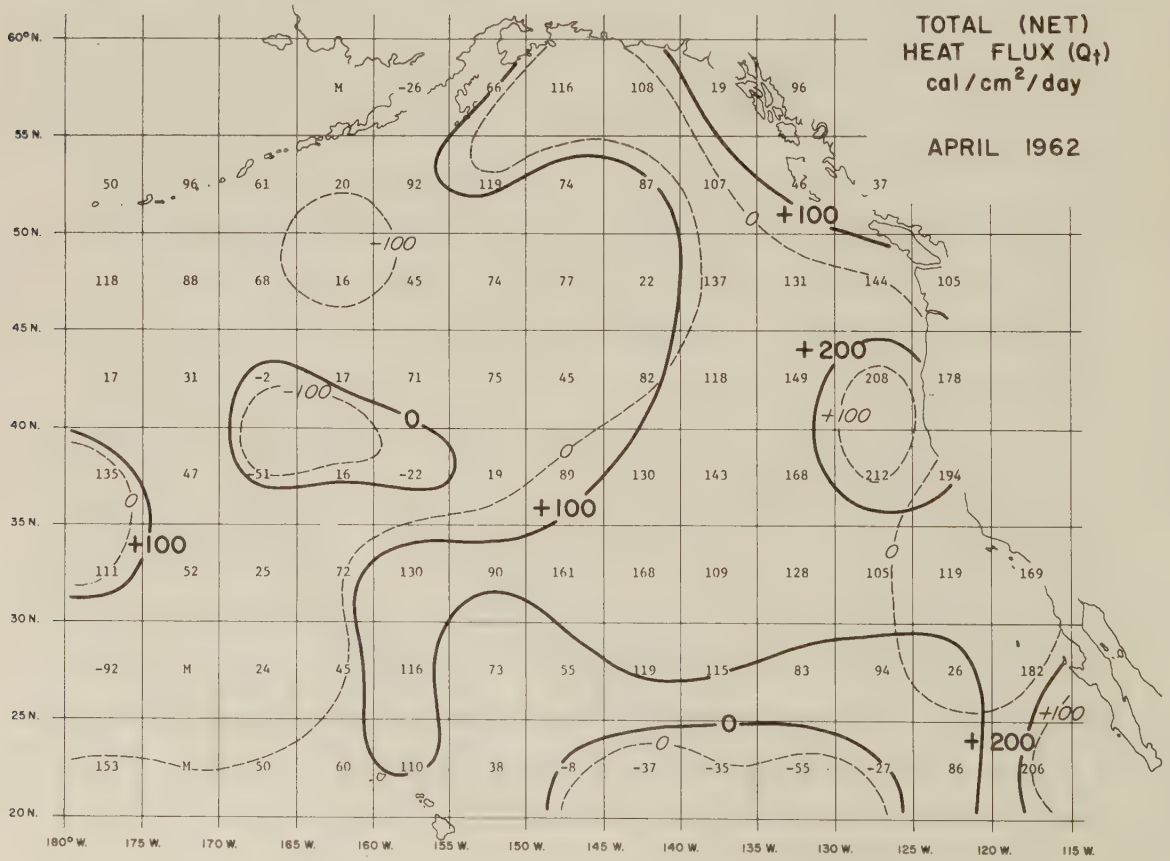

TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2/day
FEBRUARY 1962
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
-100
+100
0


TOTAL (NET)
HEAT FLUX (Q_t)
cal/cm²/day
MARCH 1962
60°N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
-100
0
+100
-200
+200


TOTAL (NET)
HEAT FLUX (Q_t)
cal/cm²/day
APRIL 1962
60°N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
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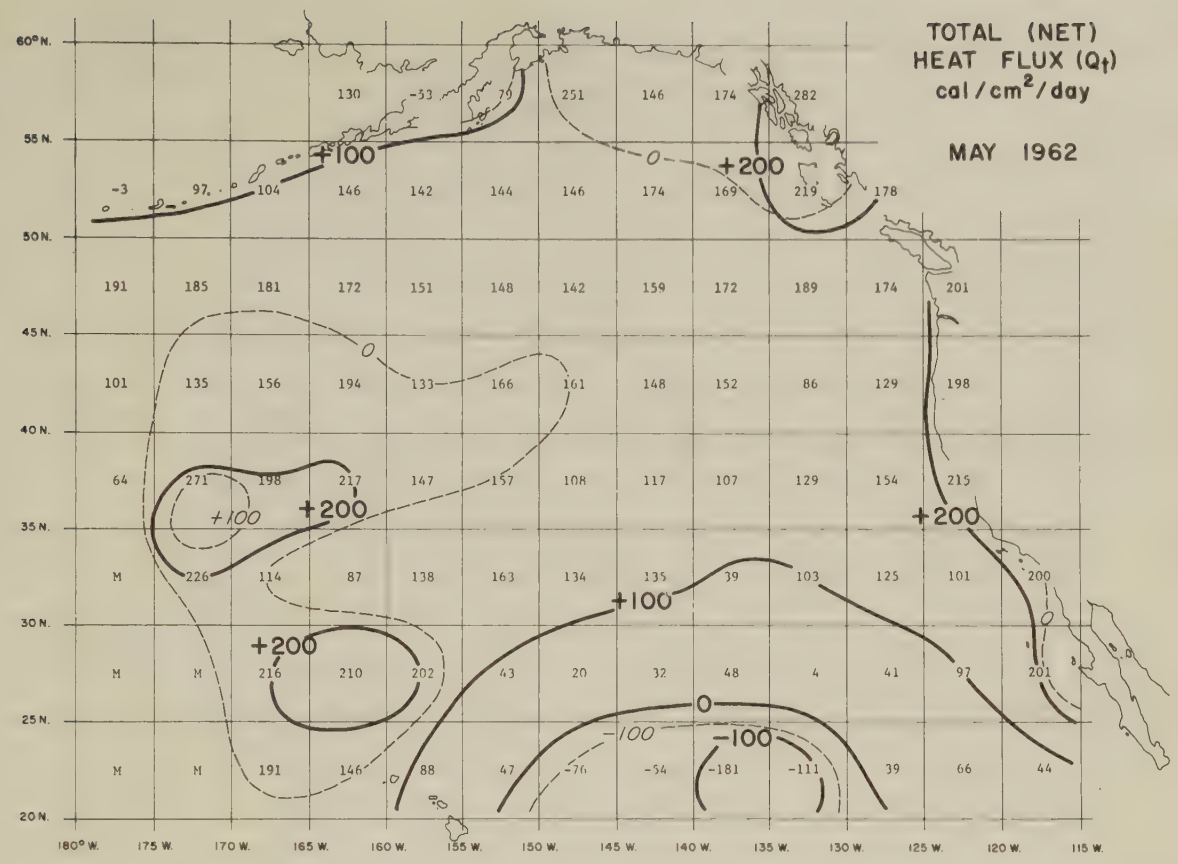
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
-100
0
+100
+200


TOTAL (NET)
HEAT FLUX (Qt)
cal / cm² / day
MAY 1962
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
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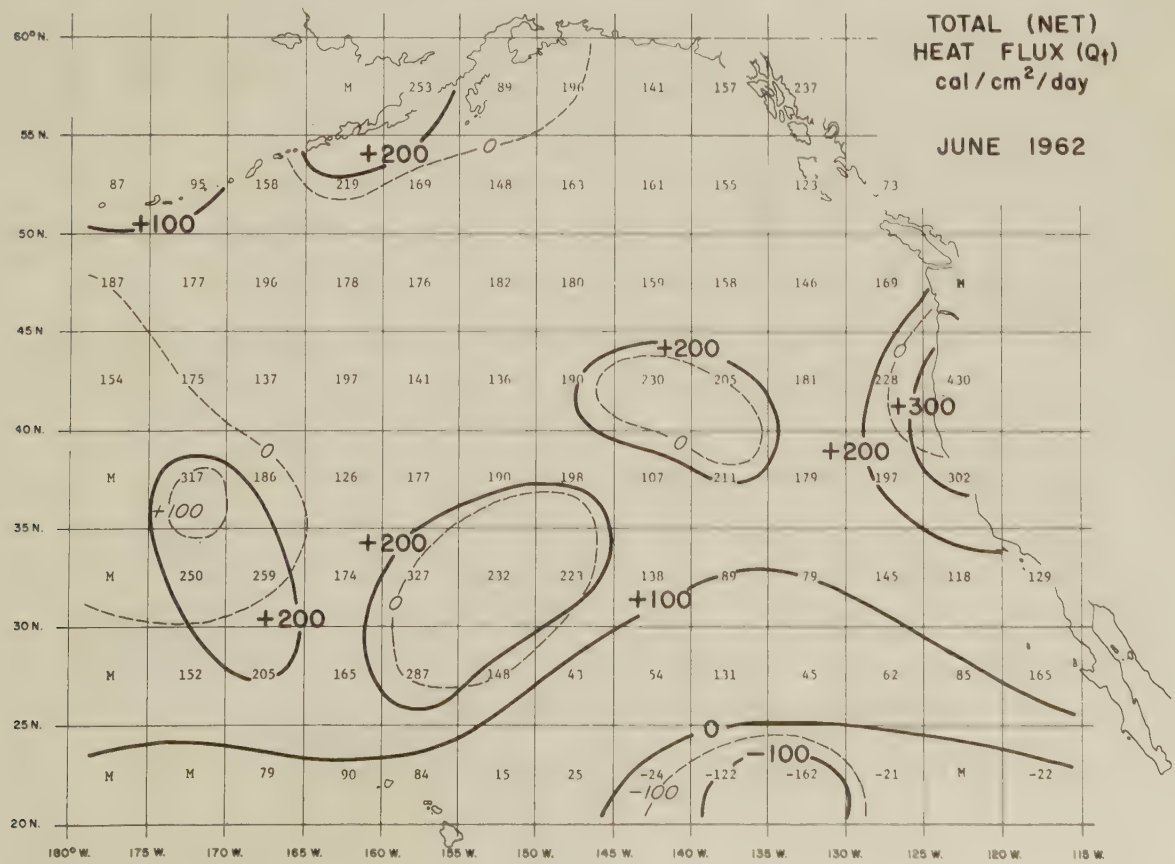
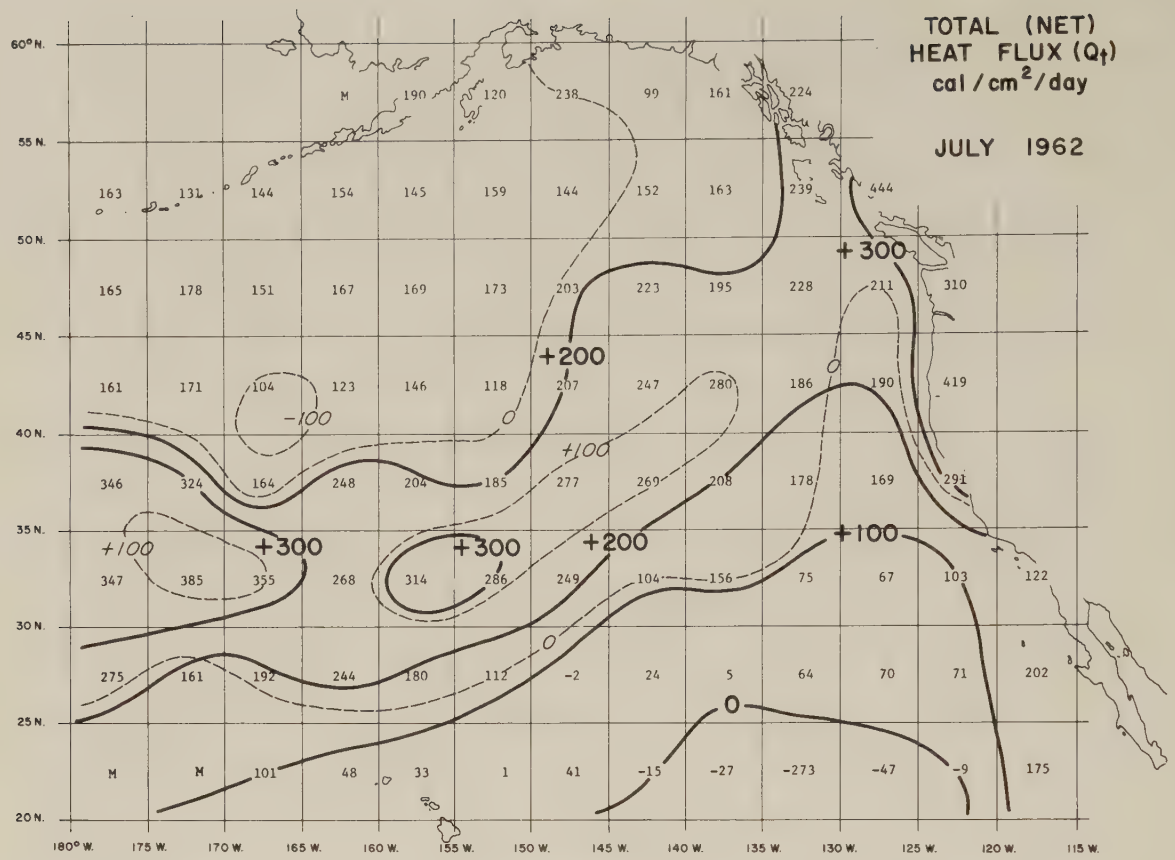
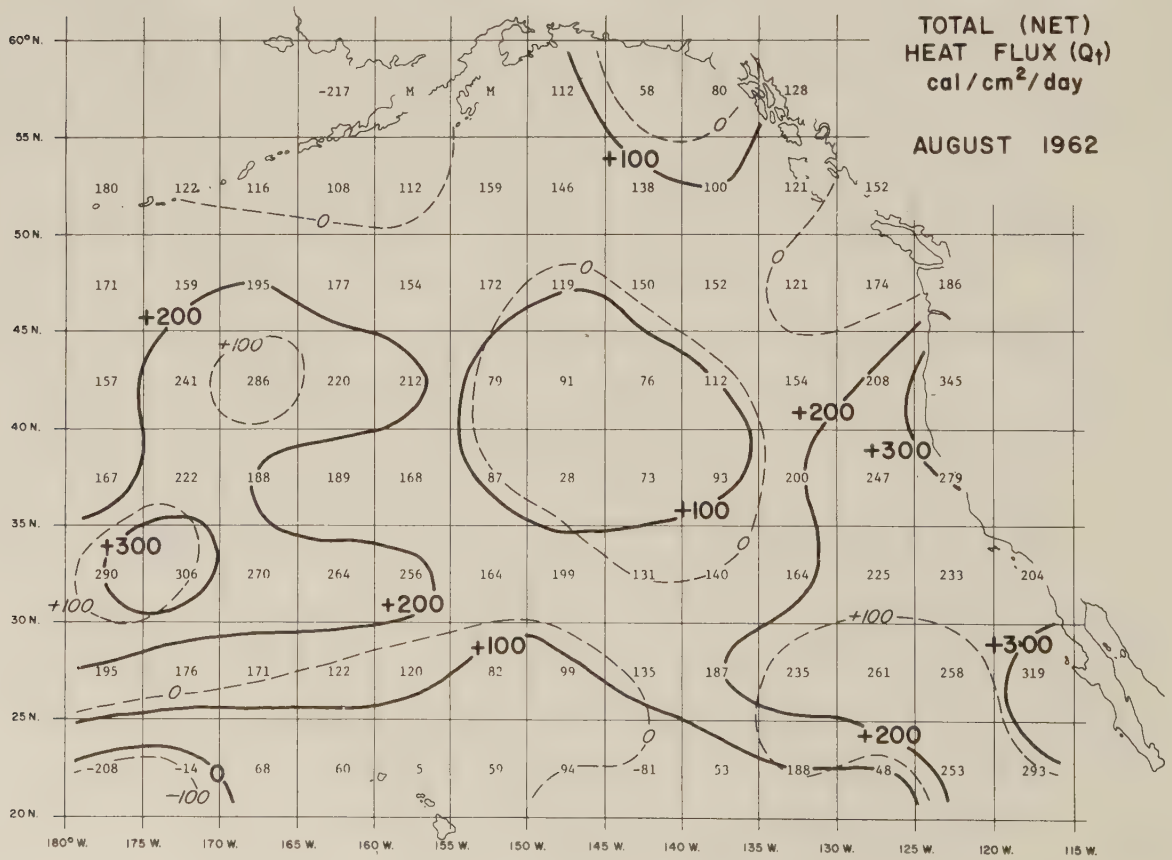
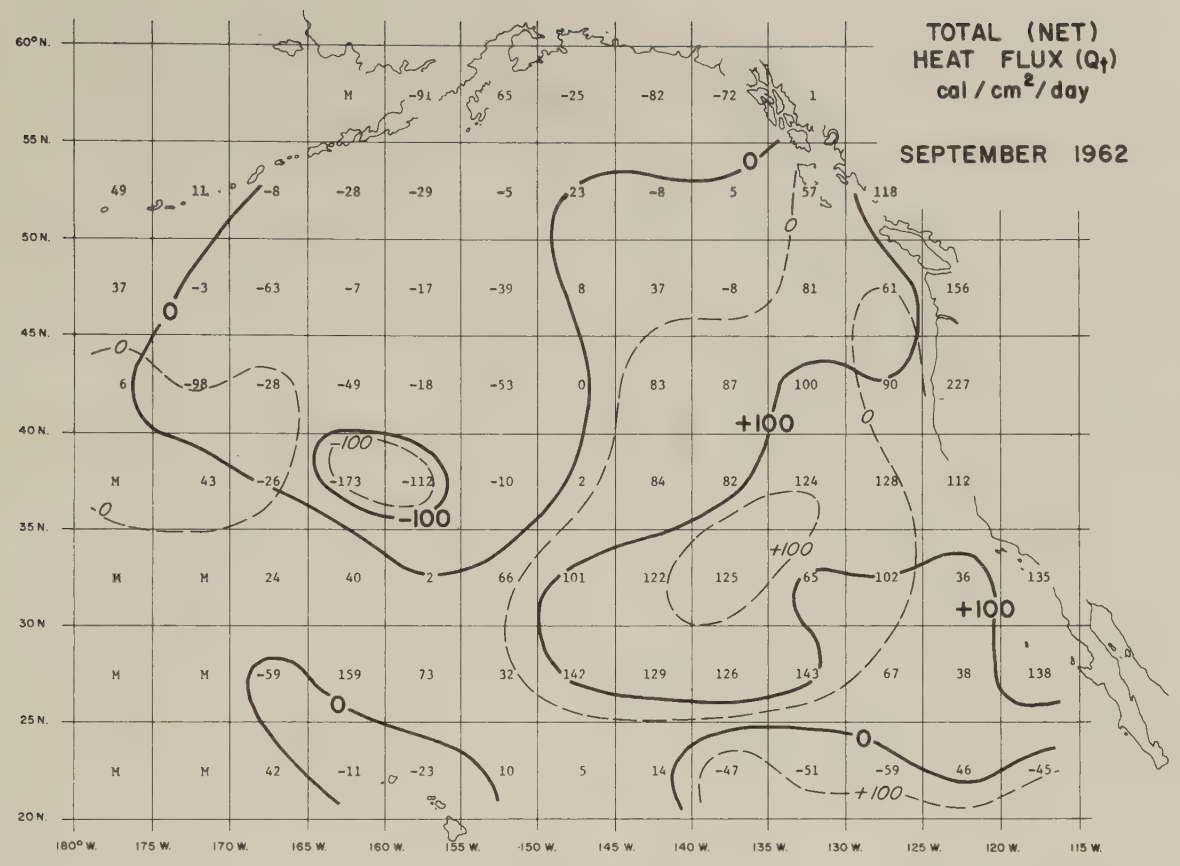
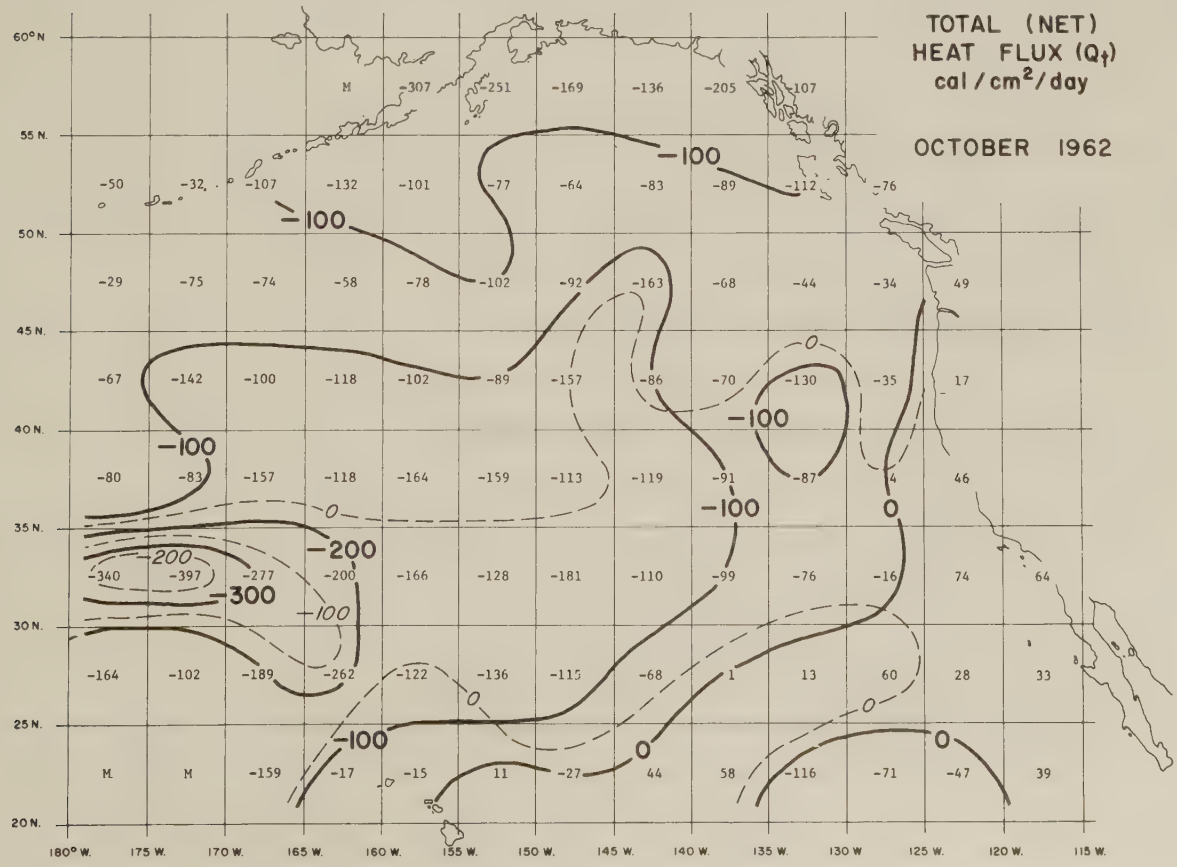
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+100
+200
0
-100

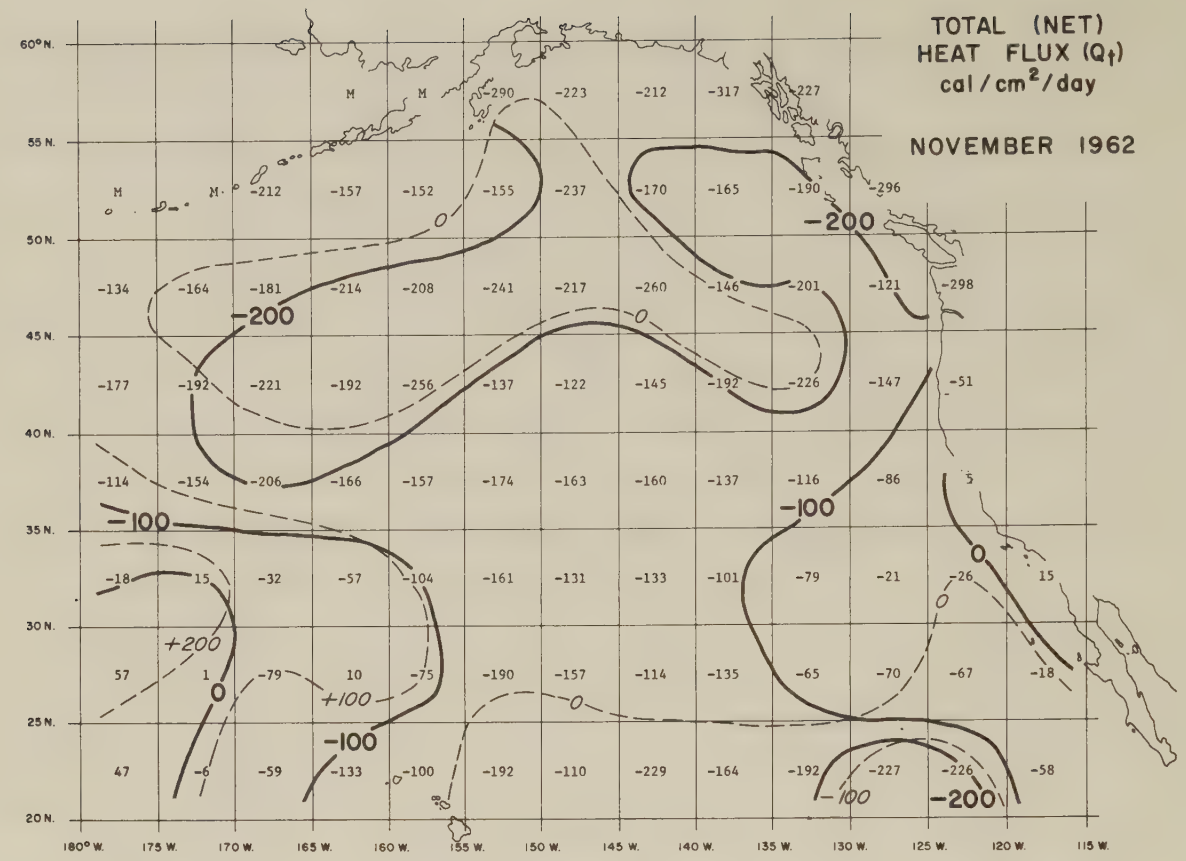

TOTAL (NET)
HEAT FLUX (Qt)
cal / cm² / day
JUNE 1962
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+100
+200
+300
0
-100


TOTAL (NET)
HEAT FLUX (Qt)
cal / cm² / day
JULY 1962
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+300
+200
+100
0
-100


TOTAL (NET)
HEAT FLUX (Qt)
cal / cm² / day
AUGUST 1962
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+300
+200
+100
0
-100


TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm² / day
SEPTEMBER 1962
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
0
-100
+100


TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm² / day
OCTOBER 1962
60° N
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W
125 W.
120 W.
115 W.
0
-100
-200
-300


TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
NOVEMBER 1962
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
M M -290 -223 -212 -317 -227
M M -212 -157 -152 -155 -237 -170 -165 -190 -296
-134 -164 -181 -214 -208 -241 -217 -260 -146 -201 -121 -298
-177 -192 -221 -192 -256 -137 -122 -145 -192 -226 -147 -51
-114 -154 -206 -166 -157 -174 -163 -160 -137 -116 -86 5
-18 15 -32 -57 -104 -161 -131 -133 -101 -79 -21 -26 15
57 1 -79 10 -75 -190 -157 -114 -135 -65 -70 -67 -18
47 -6 -59 -133 -100 -192 -110 -229 -164 -192 -227 -226 -58
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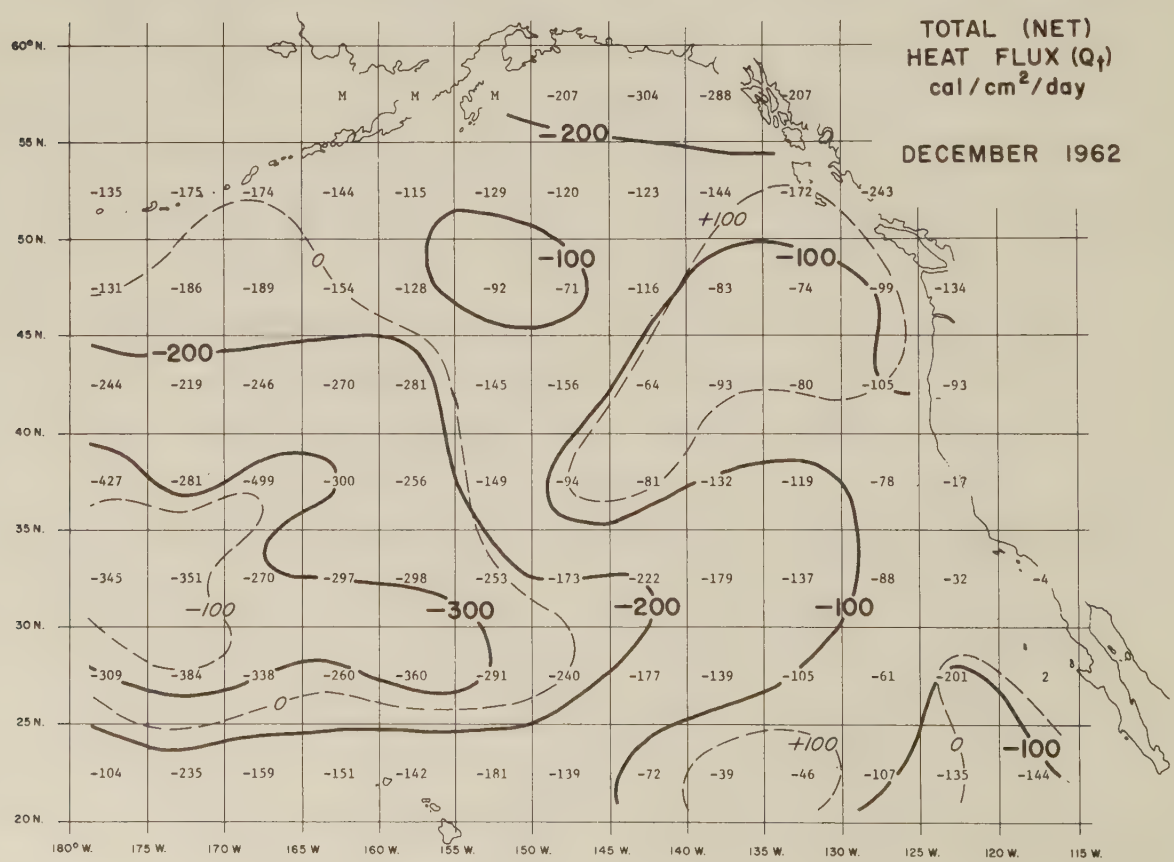
-200
+200
+100


TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
DECEMBER 1962
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
M M M -207 -304 -288 -207
-135 -175 -174 -144 -115 -129 -120 -123 -144 -172 -243
-131 -186 -189 -154 -128 -92 -71 -116 -83 -74 -99 -134
-244 -219 -246 -270 -281 -145 -156 -64 -93 -80 -105 -93
-427 -281 -499 -300 -256 -149 -94 -81 -132 -119 -78 -17
-345 -351 -270 -297 -298 -253 -173 -222 -179 -137 -88 -32 -4
-309 -384 -338 -260 -360 -291 -240 -177 -139 -105 -61 -201 2
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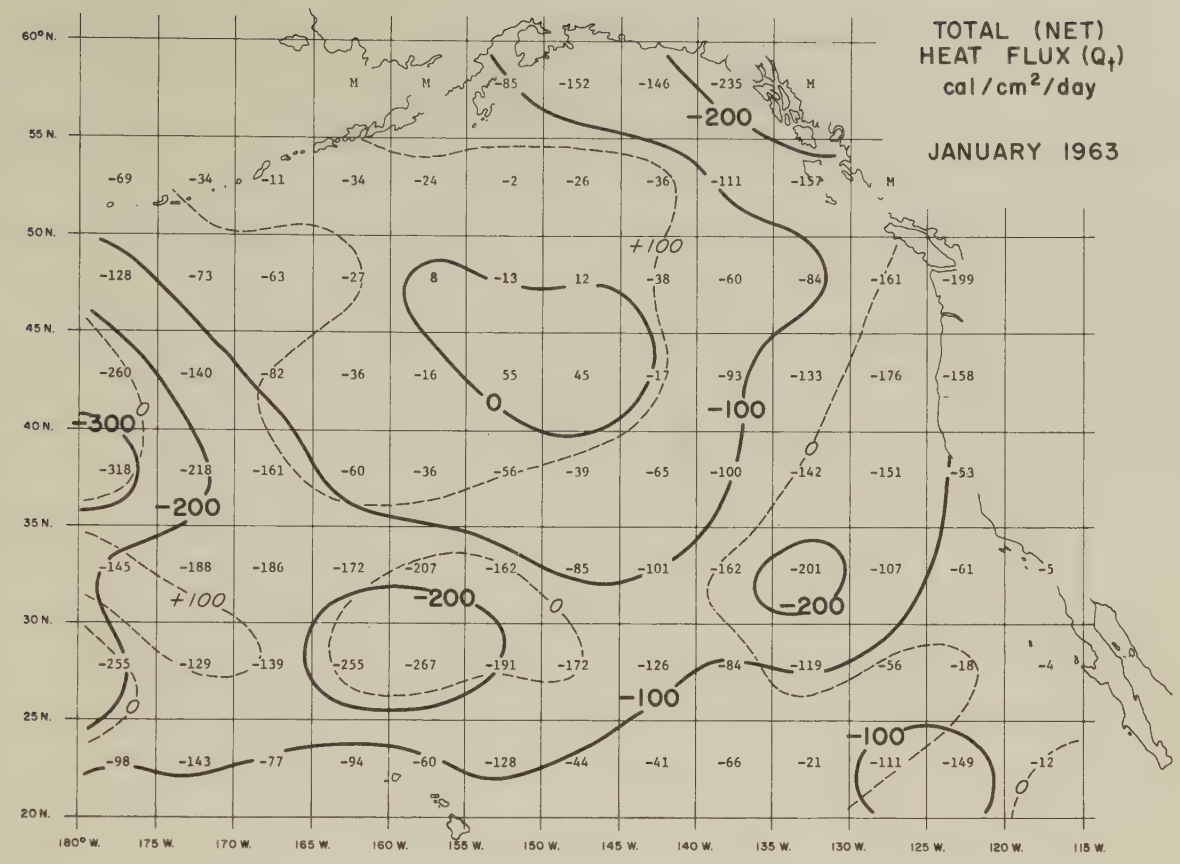
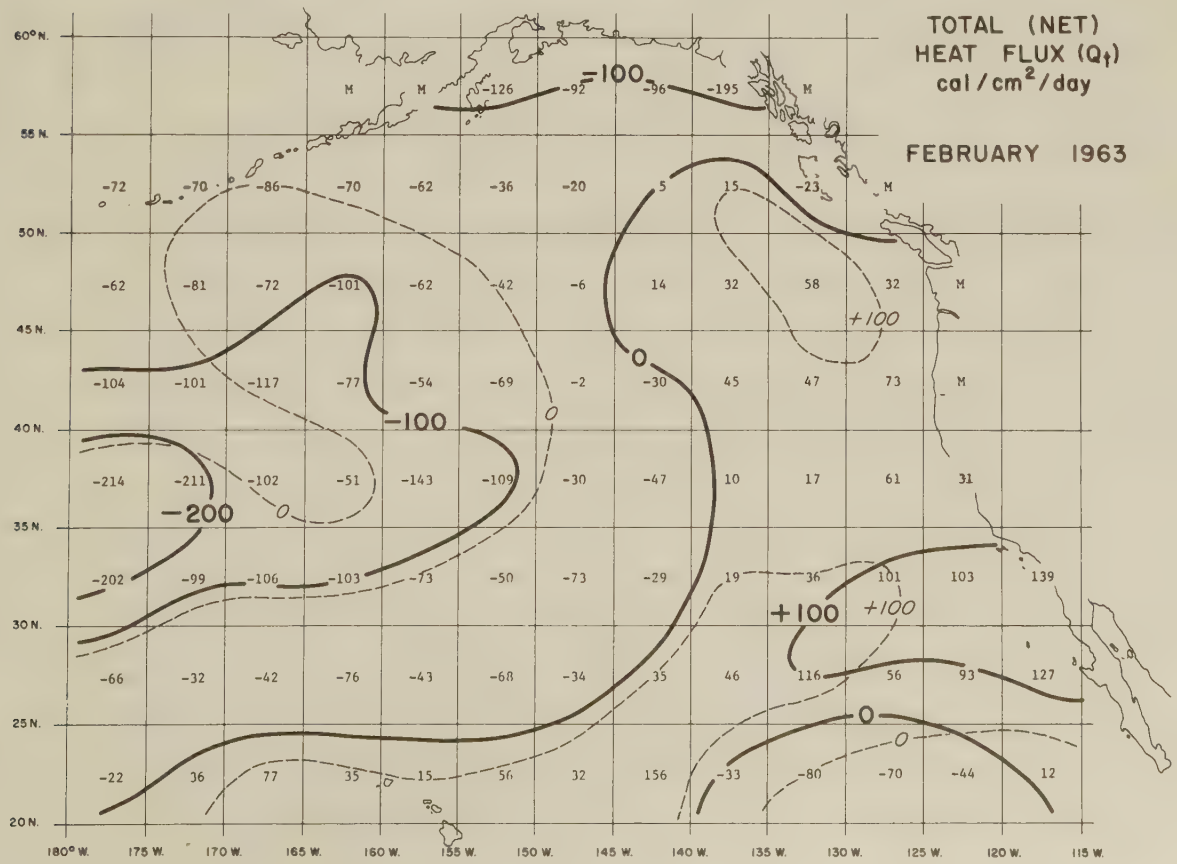
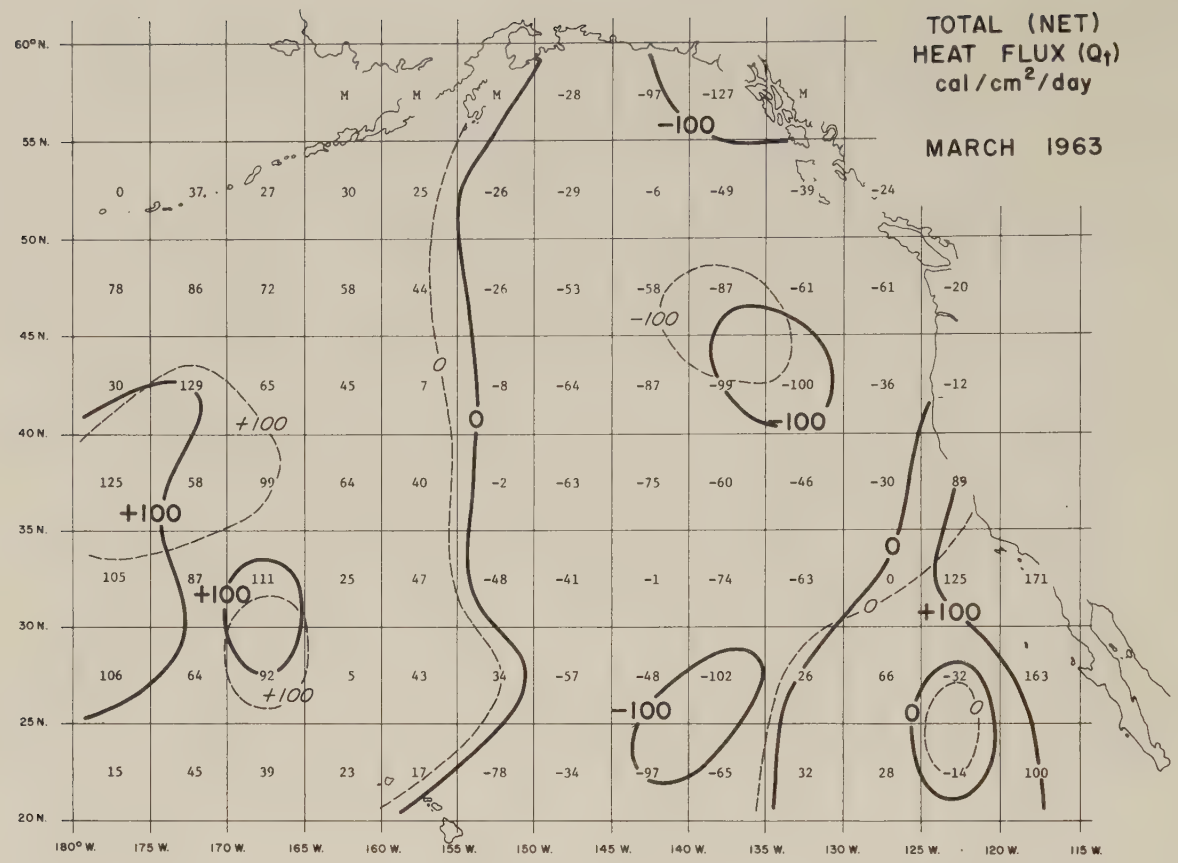
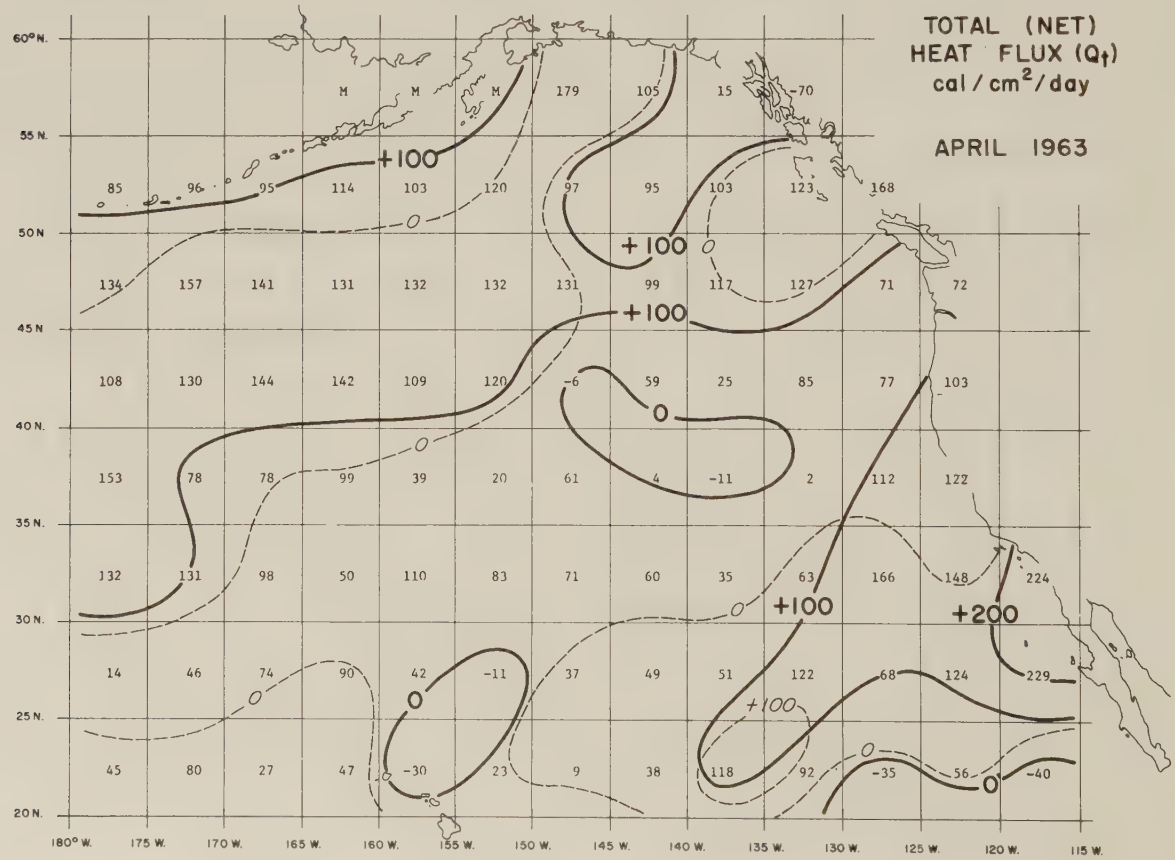
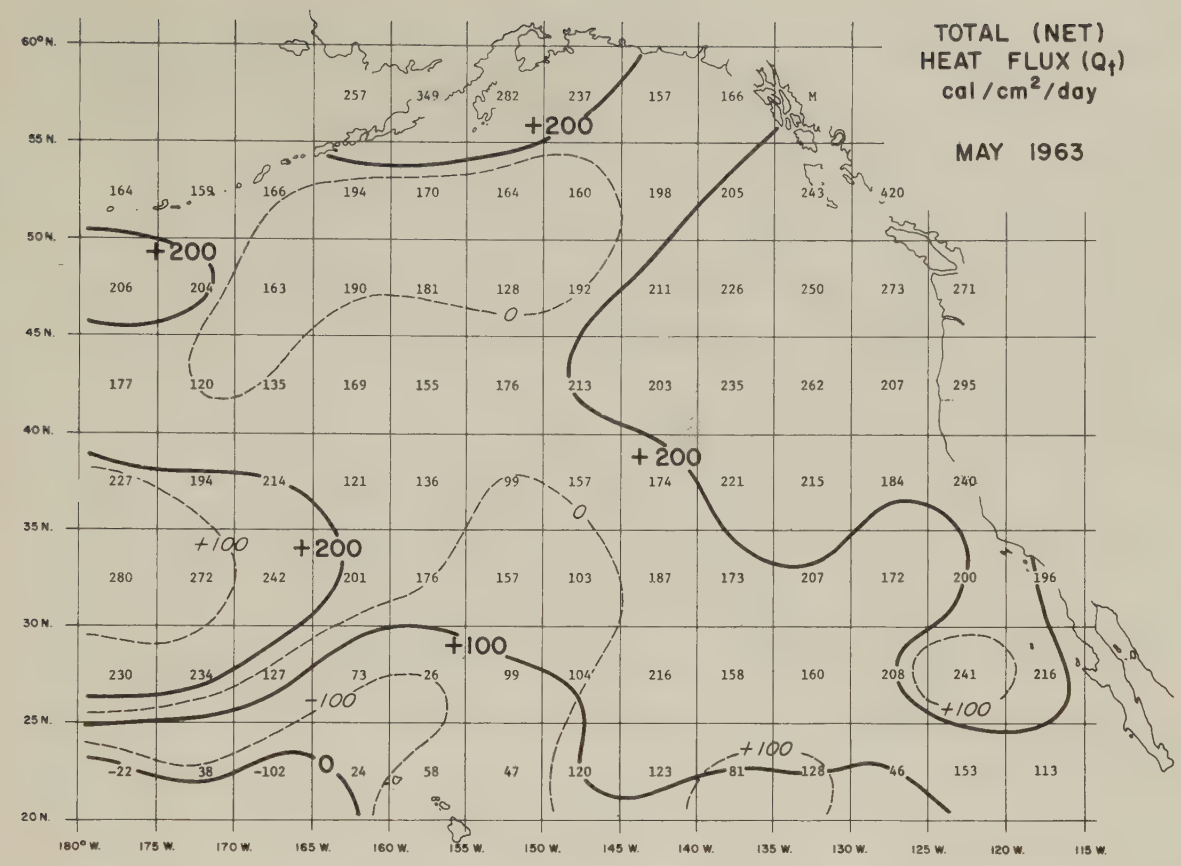
-200
-300
+100


TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm² / day
JANUARY 1963
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
-300
-200
-100
0
+100


TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm² / day
FEBRUARY 1963
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
-200
-100
0
+100


TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
MARCH 1963
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+100
-100
0


TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
APRIL 1963
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+100
+200
0


TOTAL (NET)
HEAT FLUX (Q_t)
cal/cm²/day
MAY 1963
60°N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+200
+100
0
-100
257 349 282 237 157 166 M
164 159 166 194 170 164 160 198 205 243 420
206 204 163 190 181 128 192 211 226 250 273 271
177 120 135 169 155 176 213 203 235 262 207 295
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280 272 242 201 176 157 103 187 173 207 172 200 196
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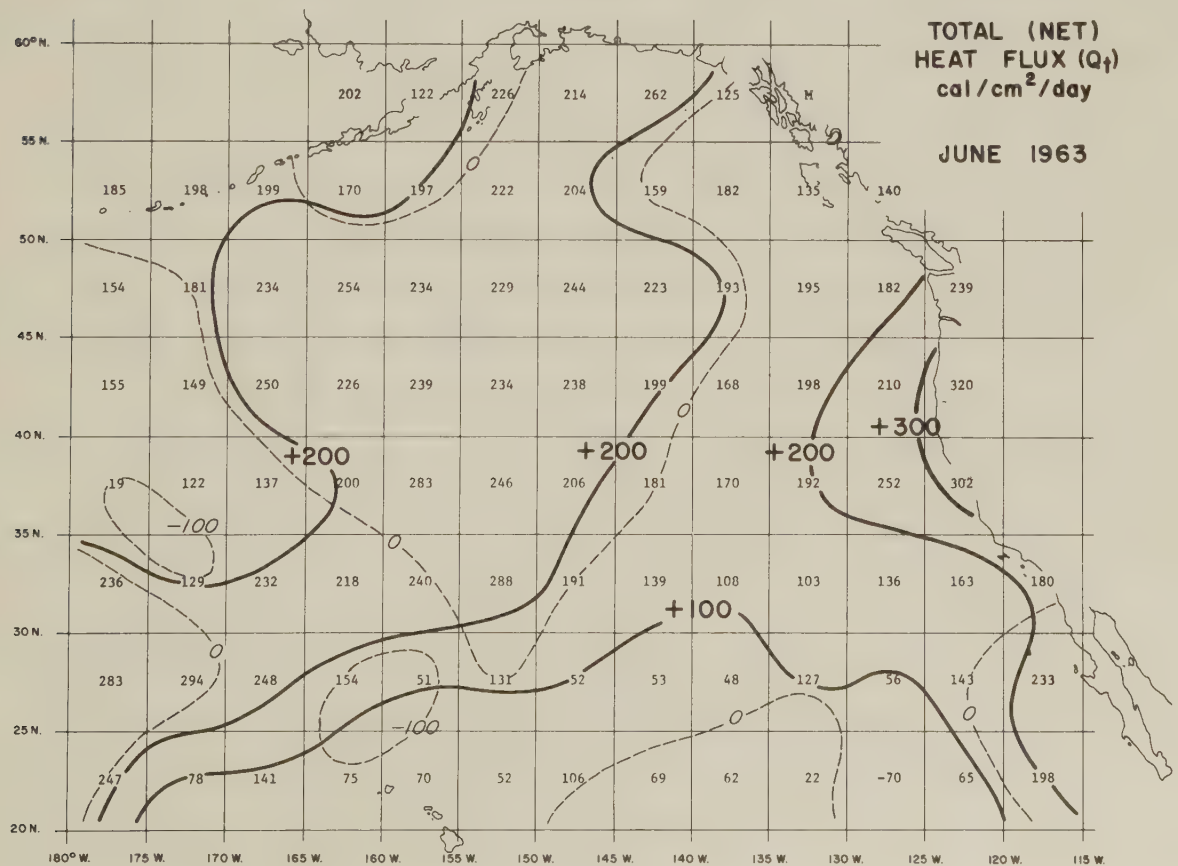
-22 38 -102 24 58 47 120 123 81 128 46 153 113


TOTAL (NET)
HEAT FLUX (Q_t)
cal/cm²/day
JUNE 1963
60°N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+300
+200
+100
0
-100
202 122 226 214 262 125 M
185 198 199 170 197 222 204 159 182 135 140
154 181 234 254 234 229 244 223 193 195 182 239
155 149 250 226 239 234 238 199 168 198 210 320
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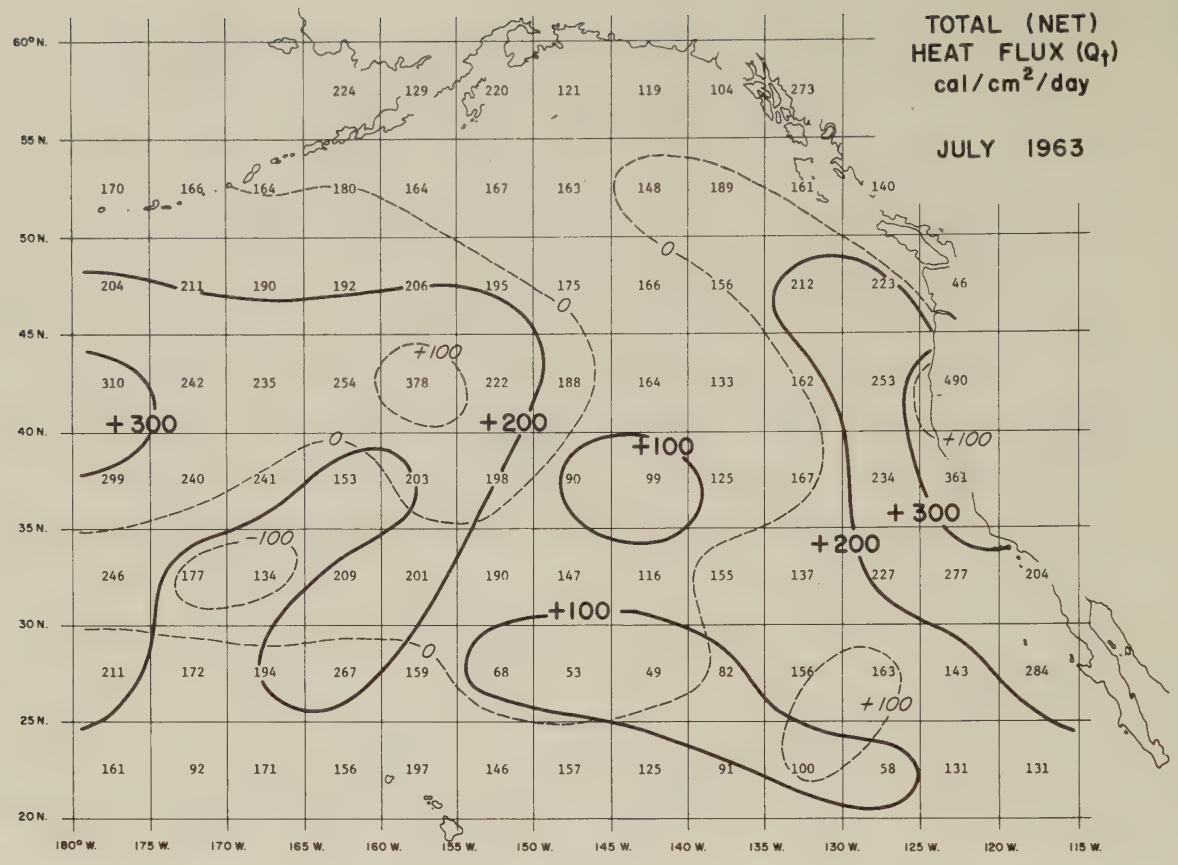
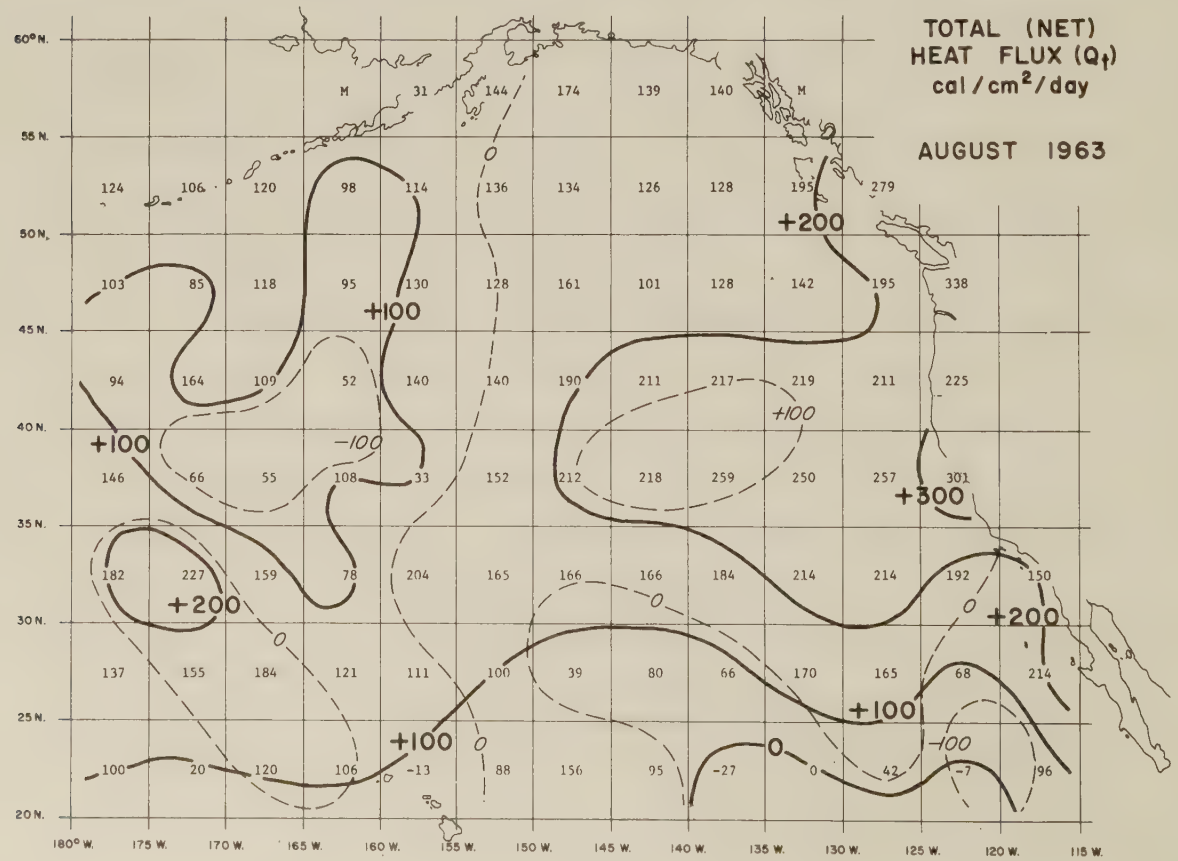
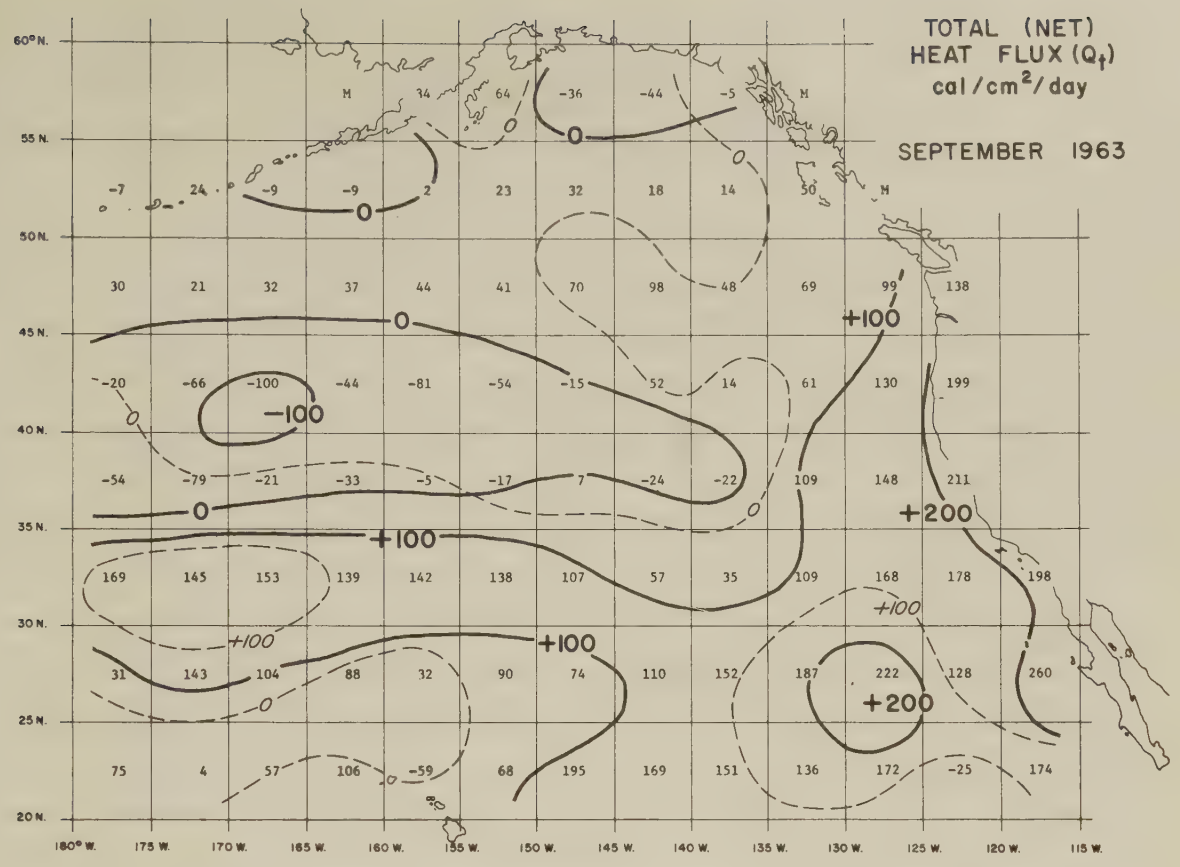

TOTAL (NET)
HEAT FLUX (Q_t)
cal/cm²/day
JULY 1963
60°N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+300
+200
+100
0
-100


TOTAL (NET)
HEAT FLUX (Q_t)
cal/cm²/day
AUGUST 1963
60°N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+300
+200
+100
0
-100


TOTAL (NET)
HEAT FLUX (Q_t)
cal/cm²/day
SEPTEMBER 1963
60°N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
M 34 64 -36 -44 -5 M
-7 24 -9 -9 2 23 32 18 14 50 M
30 21 32 37 44 41 70 98 48 69 99 138
-20 -66 -100 -44 -81 -54 -15 52 14 61 130 199
-54 -79 -21 -33 -5 -17 7 -24 -22 109 148 211
169 145 153 139 142 138 107 57 35 109 168 178 198
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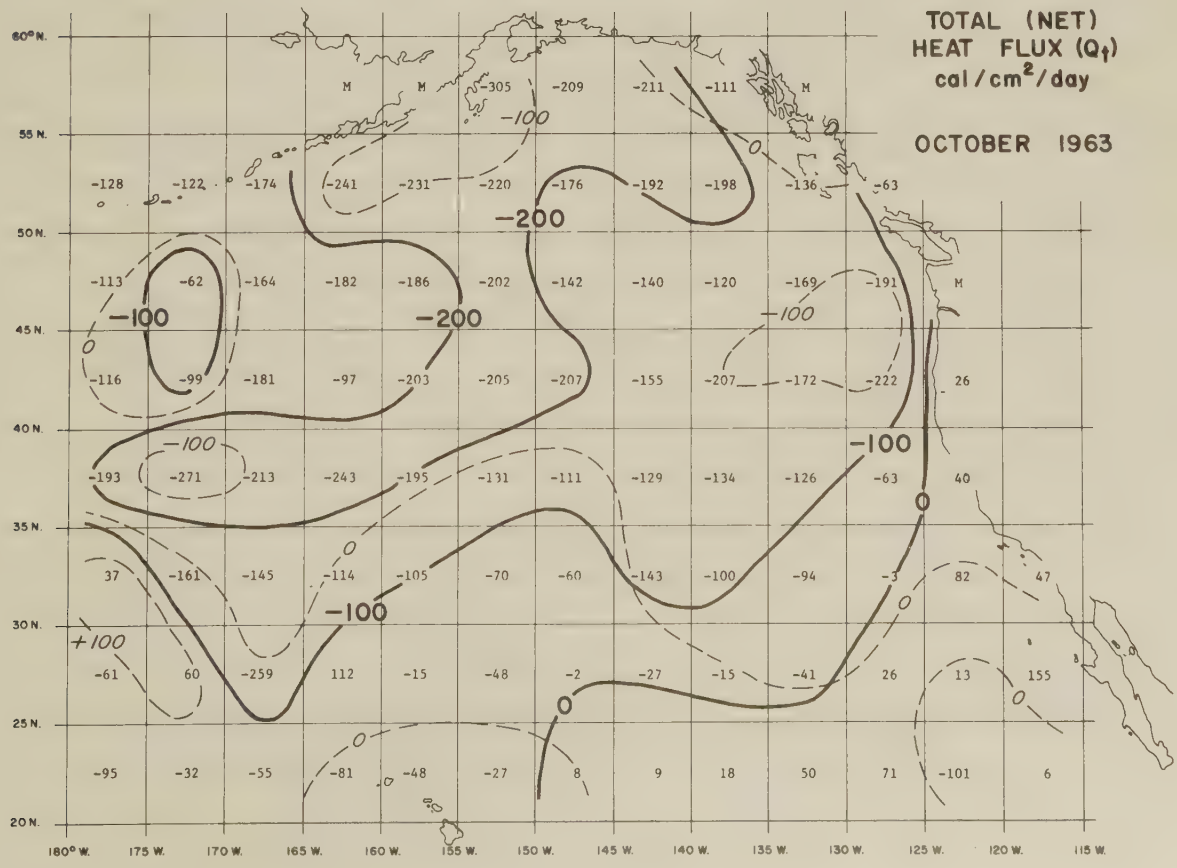
+100
+200
+100
+100
+200
+100


TOTAL (NET)
HEAT FLUX (Q_t)
cal/cm²/day
OCTOBER 1963
60°N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
M M -305 -209 -211 -111 M
-128 -122 -174 -241 -231 -220 -176 -192 -198 -136 -63
-113 -62 -164 -182 -186 -202 -142 -140 -120 -169 -191 M
-116 -99 -181 -97 -203 -205 -207 -155 -207 -172 -222 26
-193 -271 -213 -243 -195 -131 -111 -129 -134 -126 -63 40
37 -161 -145 -114 -105 -70 -60 -143 -100 -94 -3 82 47
-61 60 -259 112 -15 -48 -2 -27 -15 -41 26 13 155
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-100
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+100
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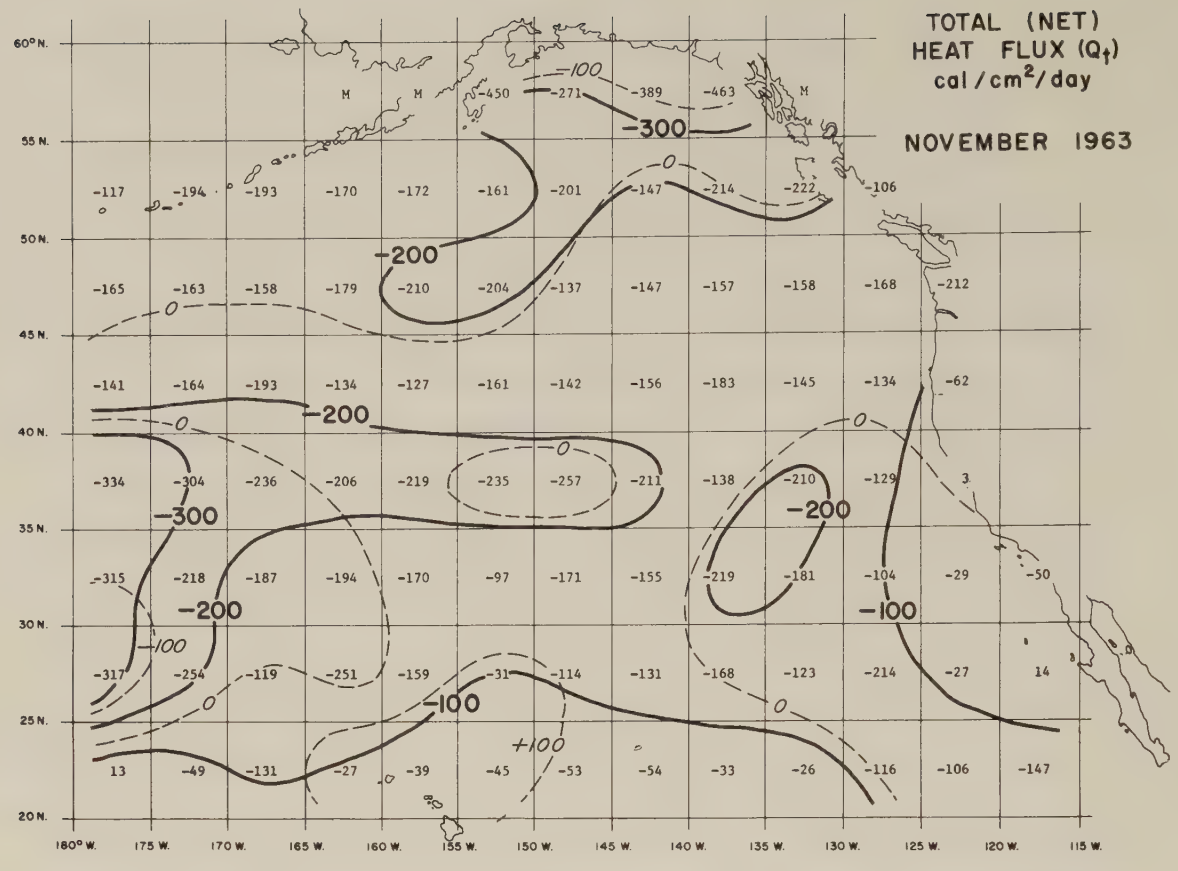
TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm² / day
NOVEMBER 1963
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
-100
-300
-200
0
+100
M
-450 -271 -389 -463
-117 -194 -193 -170 -172 -161 -201 -147 -214 -222 -106
-165 -163 -158 -179 -210 -204 -137 -147 -157 -158 -168 -212
-141 -164 -193 -134 -127 -161 -142 -156 -183 -145 -134 -62
-334 -304 -236 -206 -219 -235 -257 -211 -138 -210 -129 3
-315 -218 -187 -194 -170 -97 -171 -155 -219 -181 -104 -29 -50
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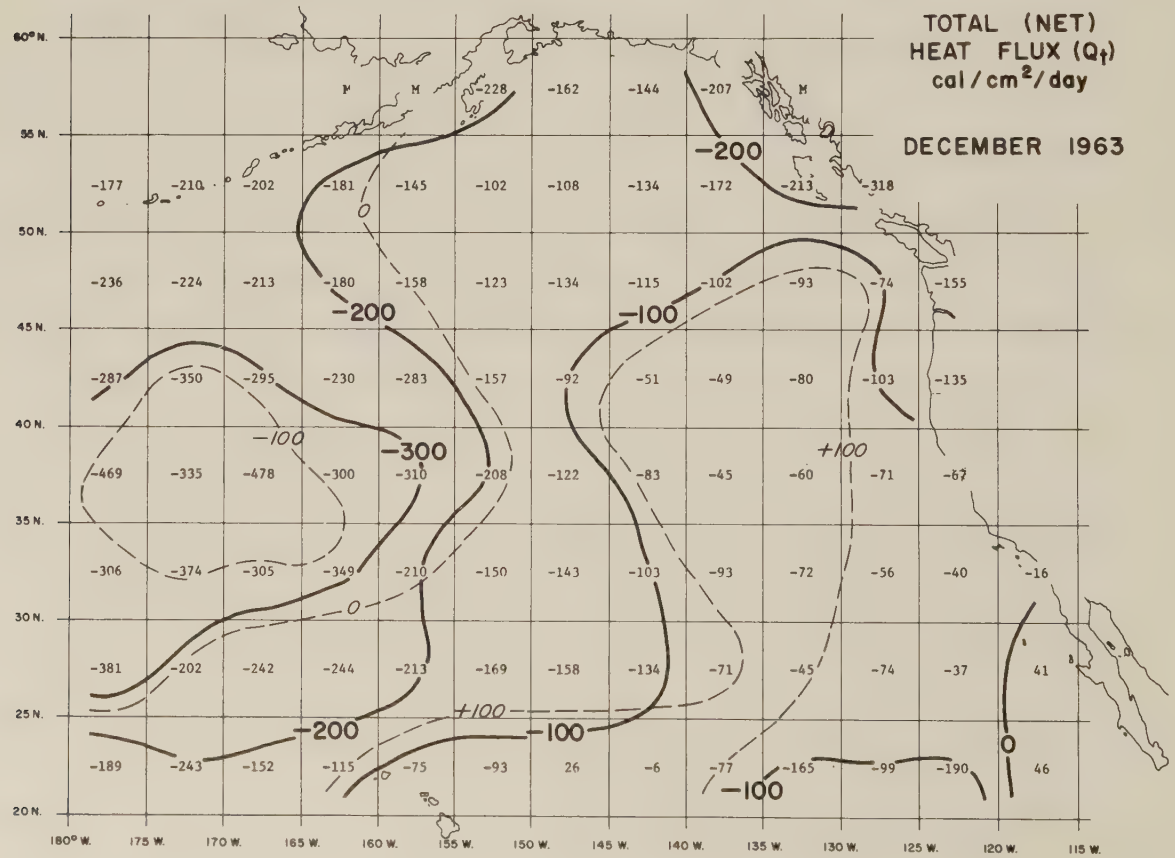
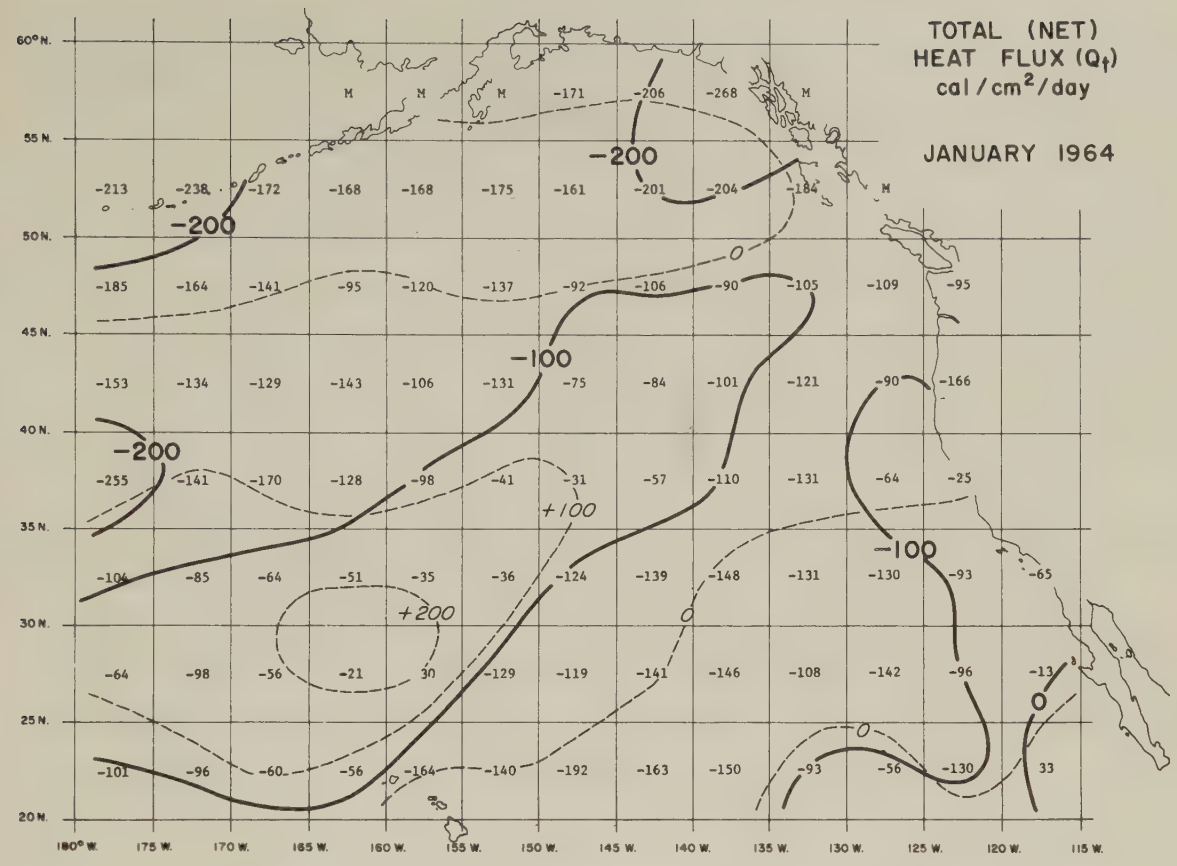
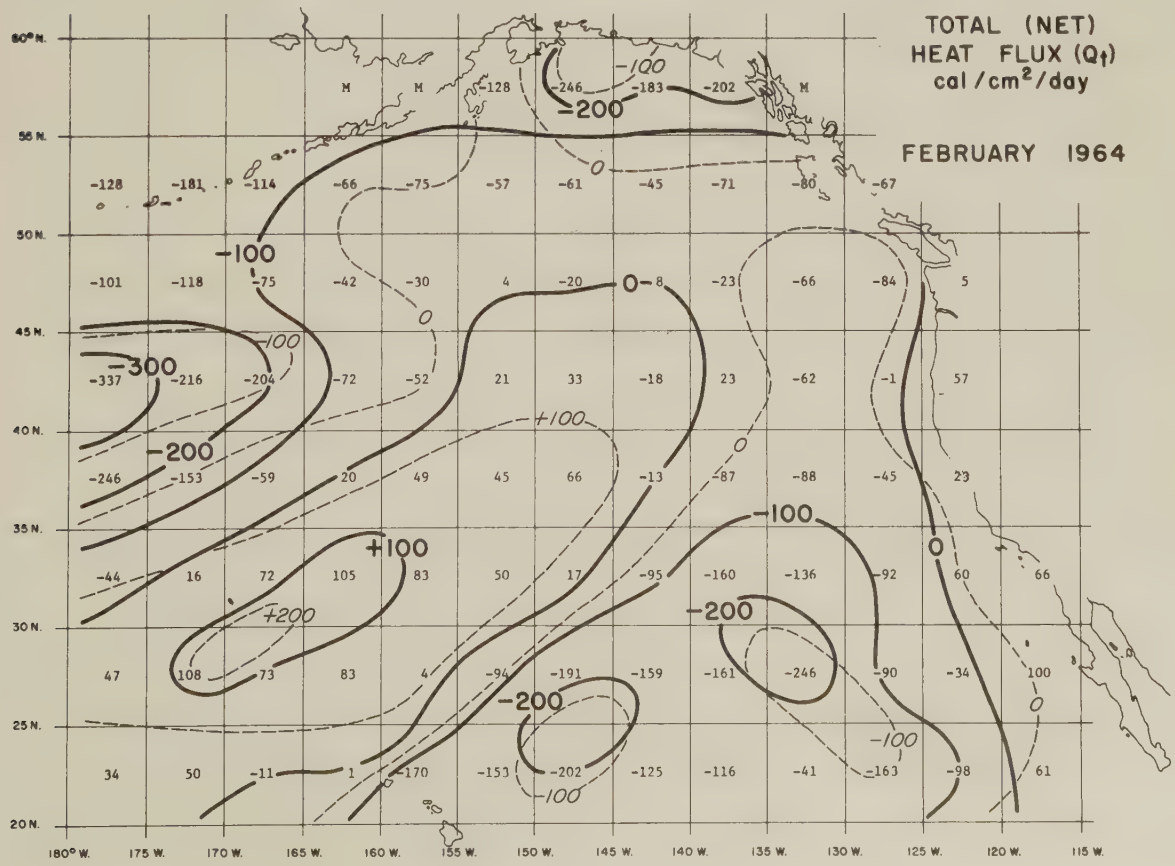
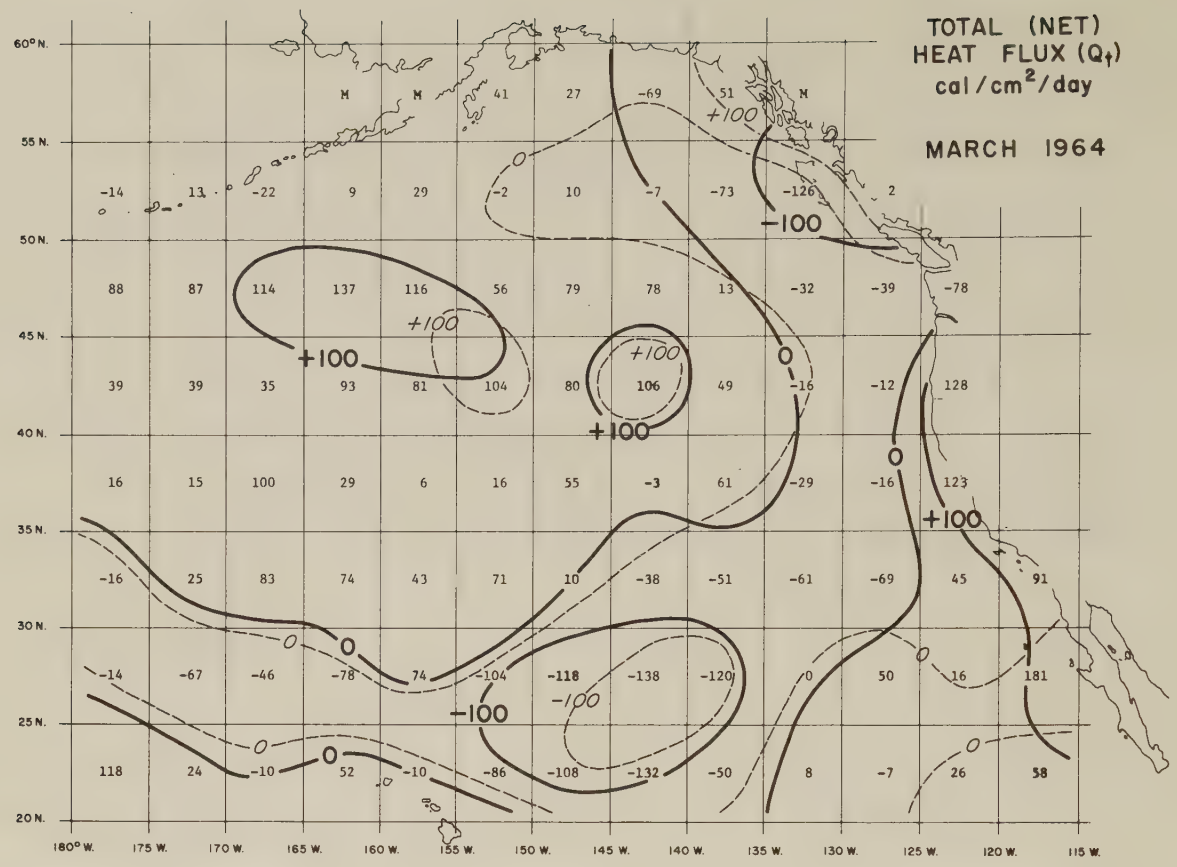
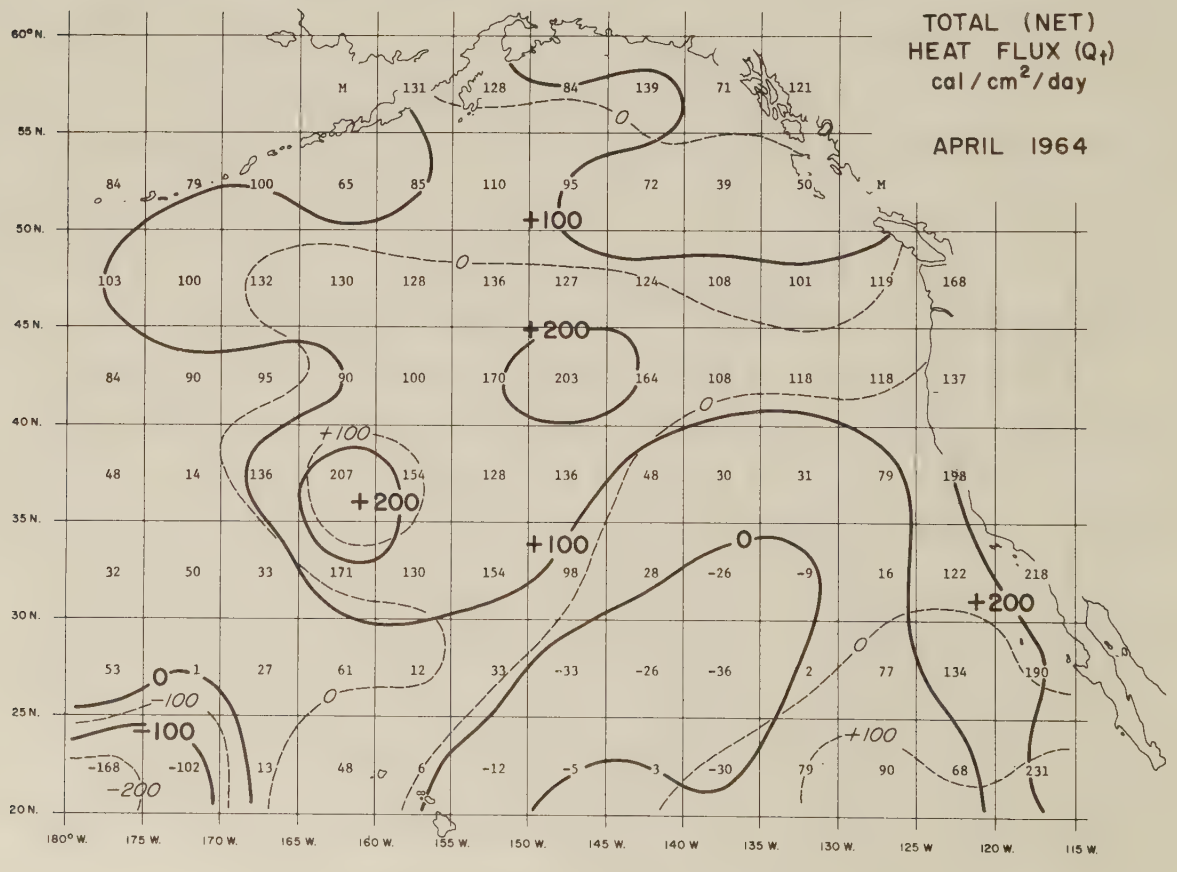
13 -49 -131 -27 -39 -45 -53 -54 -33 -26 -116 -106 -147

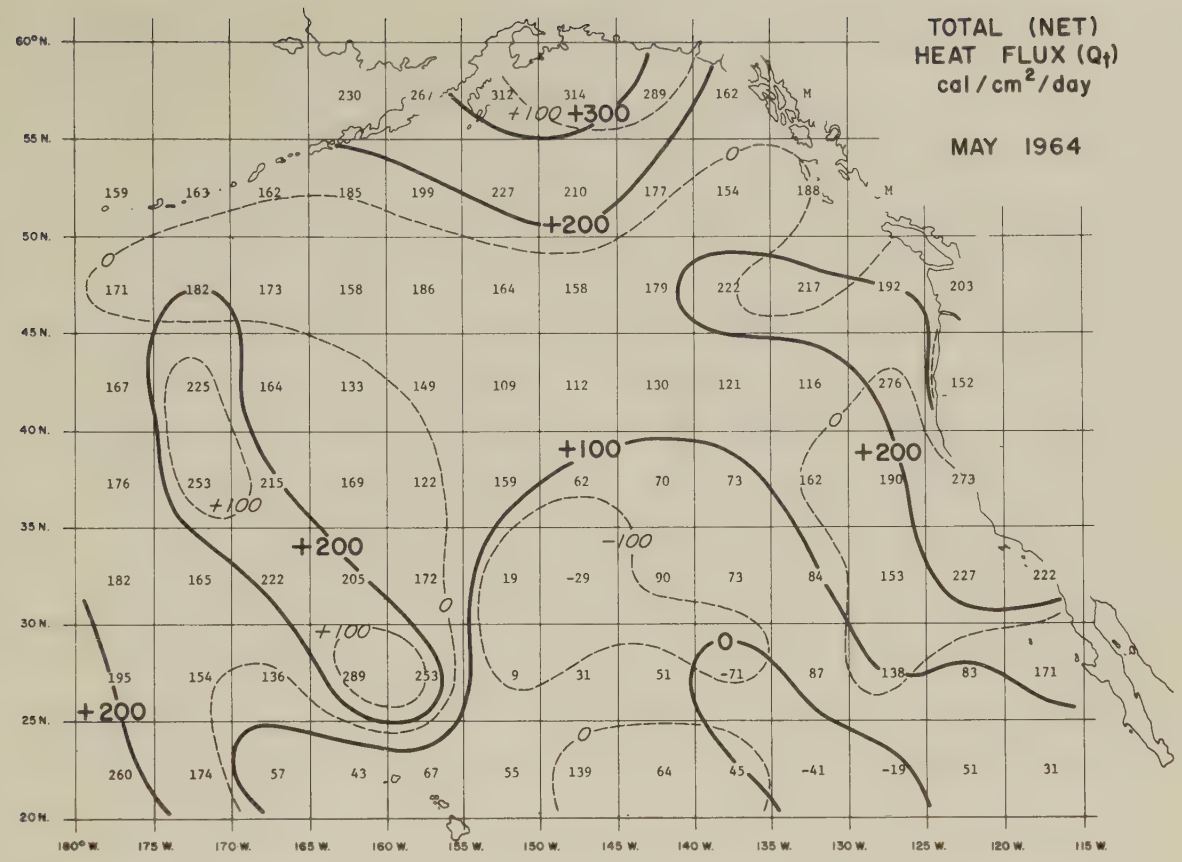

TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm² / day
DECEMBER 1963
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
-100
-300
-200
0
+100
M
-228 -162 -144 -207
-177 -210 -202 -181 -145 -102 -108 -134 -172 -213 -318
-236 -224 -213 -180 -158 -123 -134 -115 -102 -93 -74 -155
-287 -350 -295 -230 -283 -157 -92 -51 -49 -80 -103 -135
-469 -335 -478 -300 -310 -208 -122 -83 -45 -60 -71 -67
-306 -374 -305 -349 -210 -150 -143 -103 -93 -72 -56 -40 -16
-381 -202 -242 -244 -213 -169 -158 -134 -71 -45 -74 -37 41
-189 -243 -152 -115 -75 -93 26 -6 -77 -165 -99 -190 46

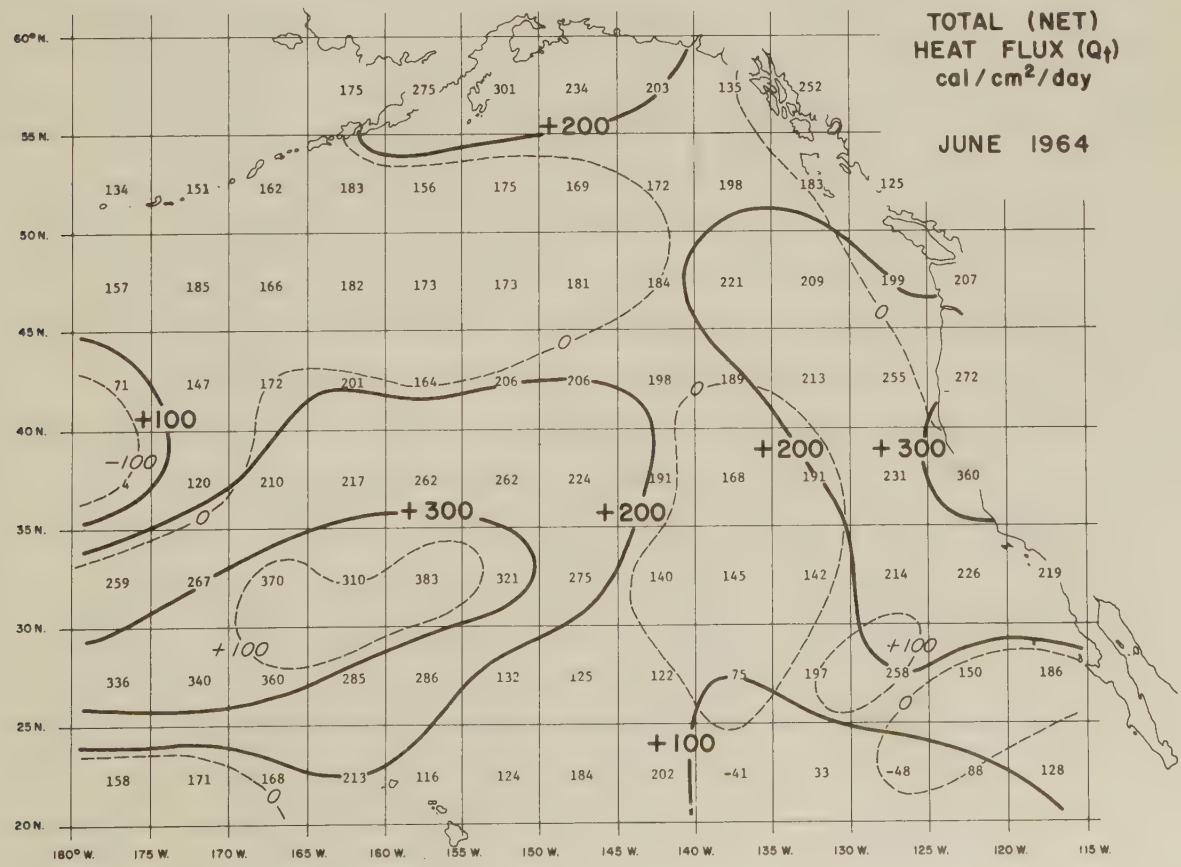

TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm² / day
JANUARY 1964
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.

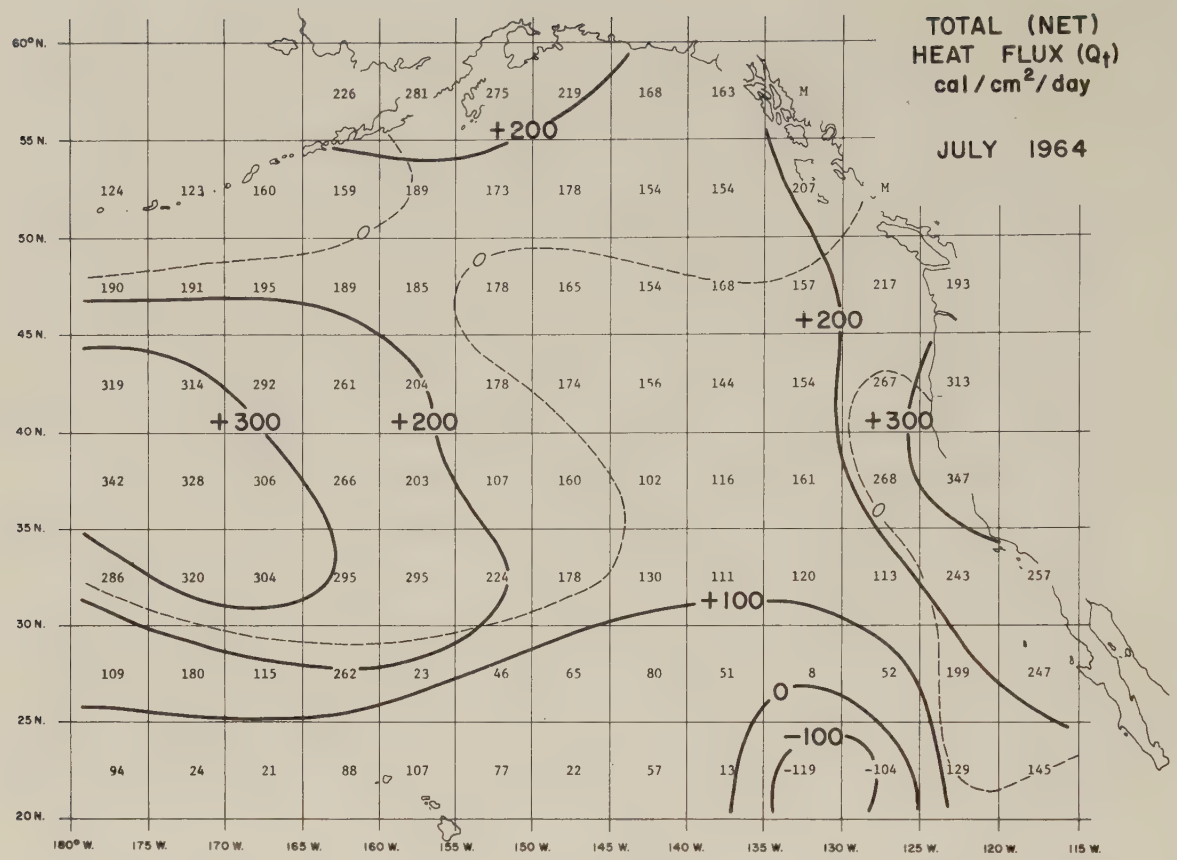

TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm² / day
FEBRUARY 1964
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.

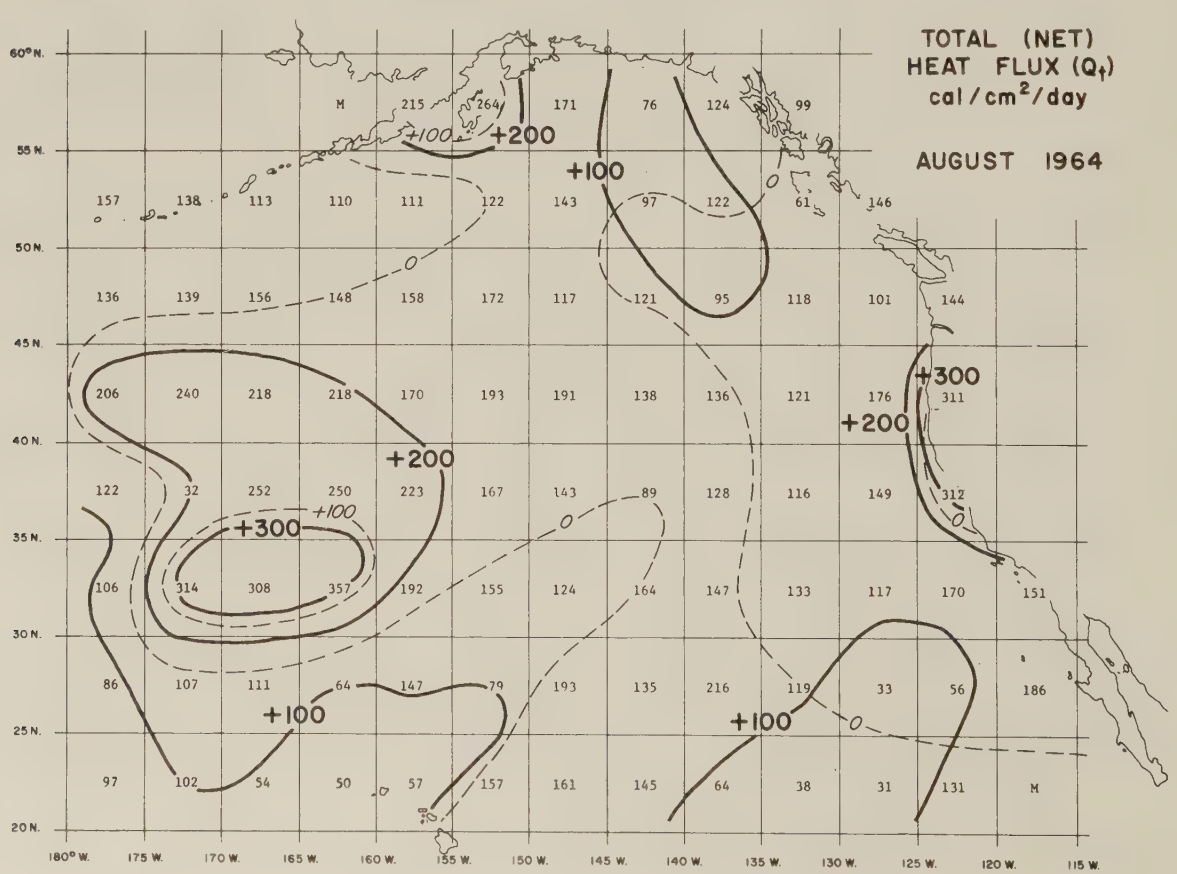

TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
MARCH 1964
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+100
0
-100

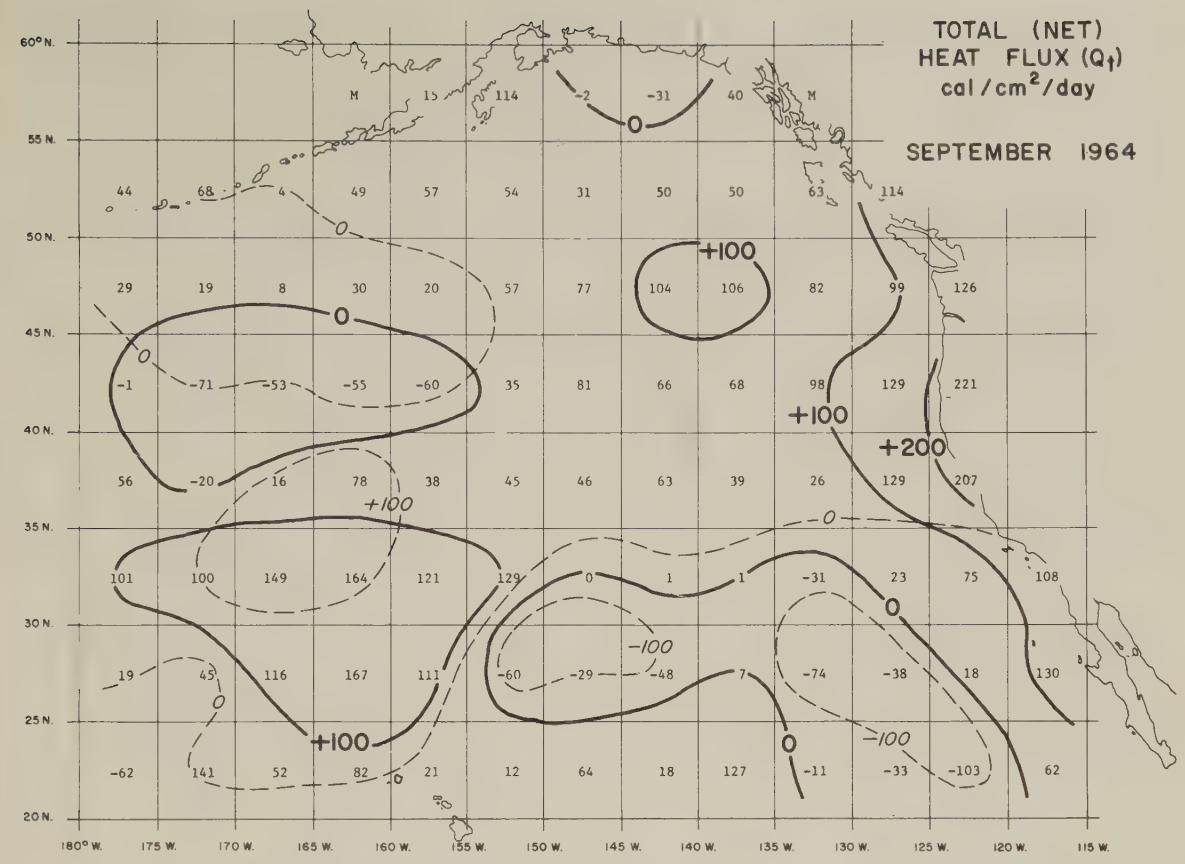

TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
APRIL 1964
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+200
+100
0
-100
-200

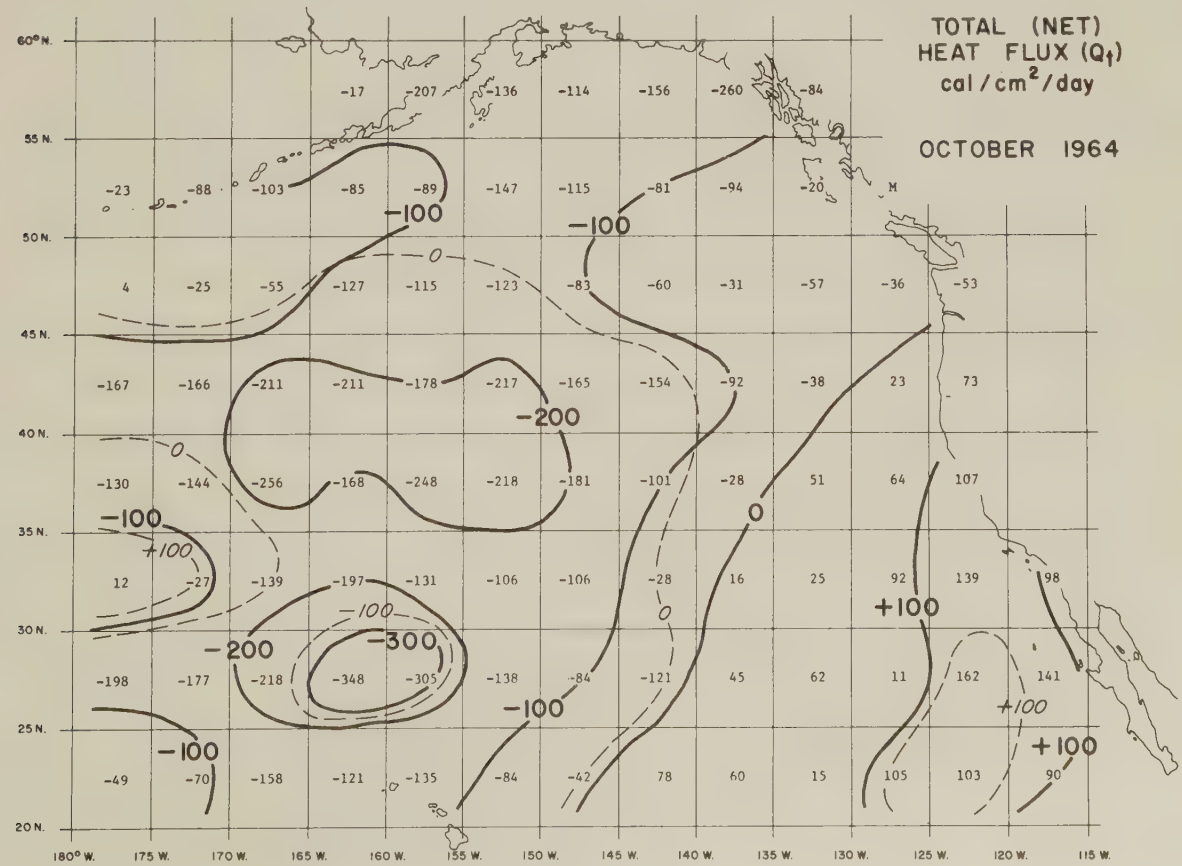

TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm² / day
MAY 1964
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+100
+300
+200
0
-100
230 261 312 314 289 162
159 163 162 185 199 227 210 177 154 188
171 182 173 158 186 164 158 179 222 217 192 203
167 225 164 133 149 109 112 130 121 116 276 152
176 253 215 169 122 159 62 70 73 162 190 273
182 165 222 205 172 19 -29 90 73 84 153 227 222
195 154 136 289 253 9 31 51 -71 87 138 83 171
260 174 57 43 67 55 139 64 45 -41 -19 51 31

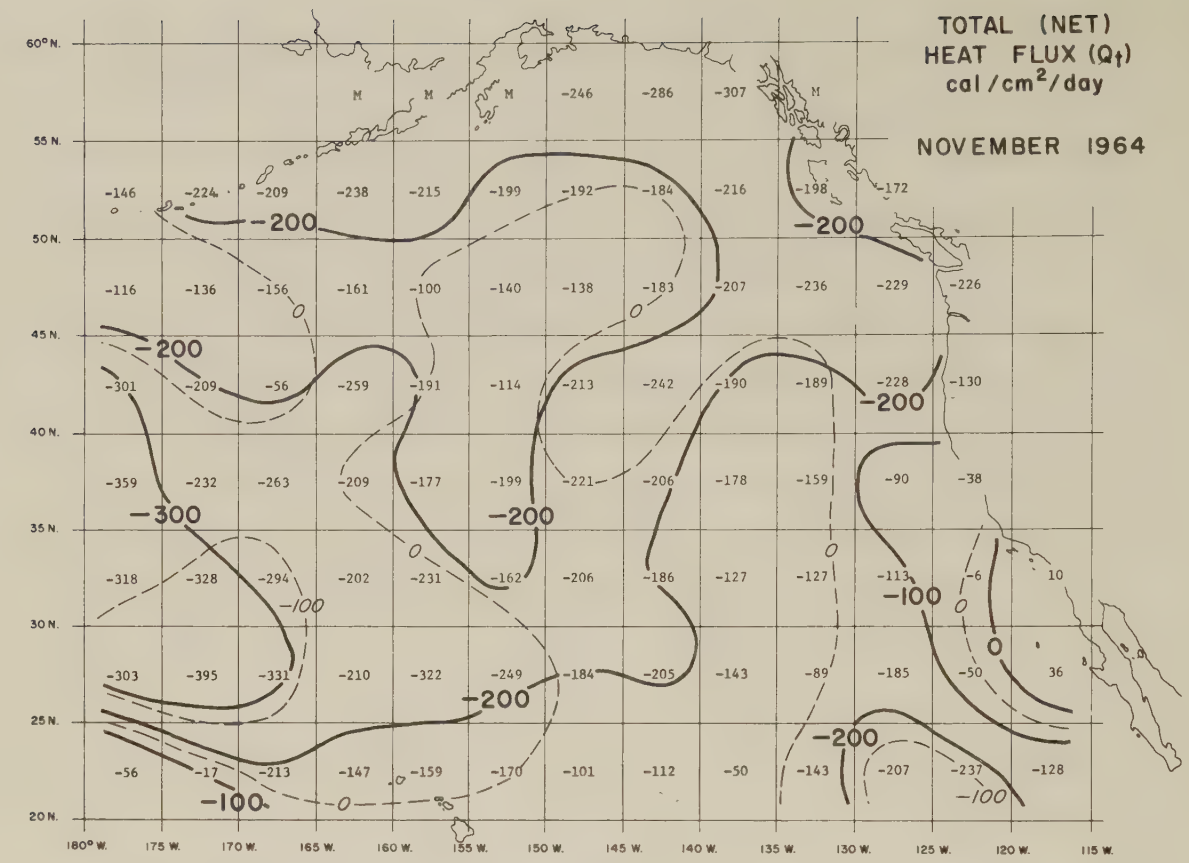

TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm² / day
JUNE 1964
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+100
+200
+300
0
-100
175 275 301 234 203 135 252
134 151 162 183 156 175 169 172 198 183 125
157 185 166 182 173 173 181 184 221 209 199 207
71 147 172 201 164 206 206 198 189 213 255 272
120 210 217 262 262 224 191 168 191 231 360
259 267 370 310 383 321 275 140 145 142 214 226 219
336 340 360 285 286 132 125 122 75 197 258 150 186
158 171 168 213 116 124 184 202 -41 33 -48 88 128

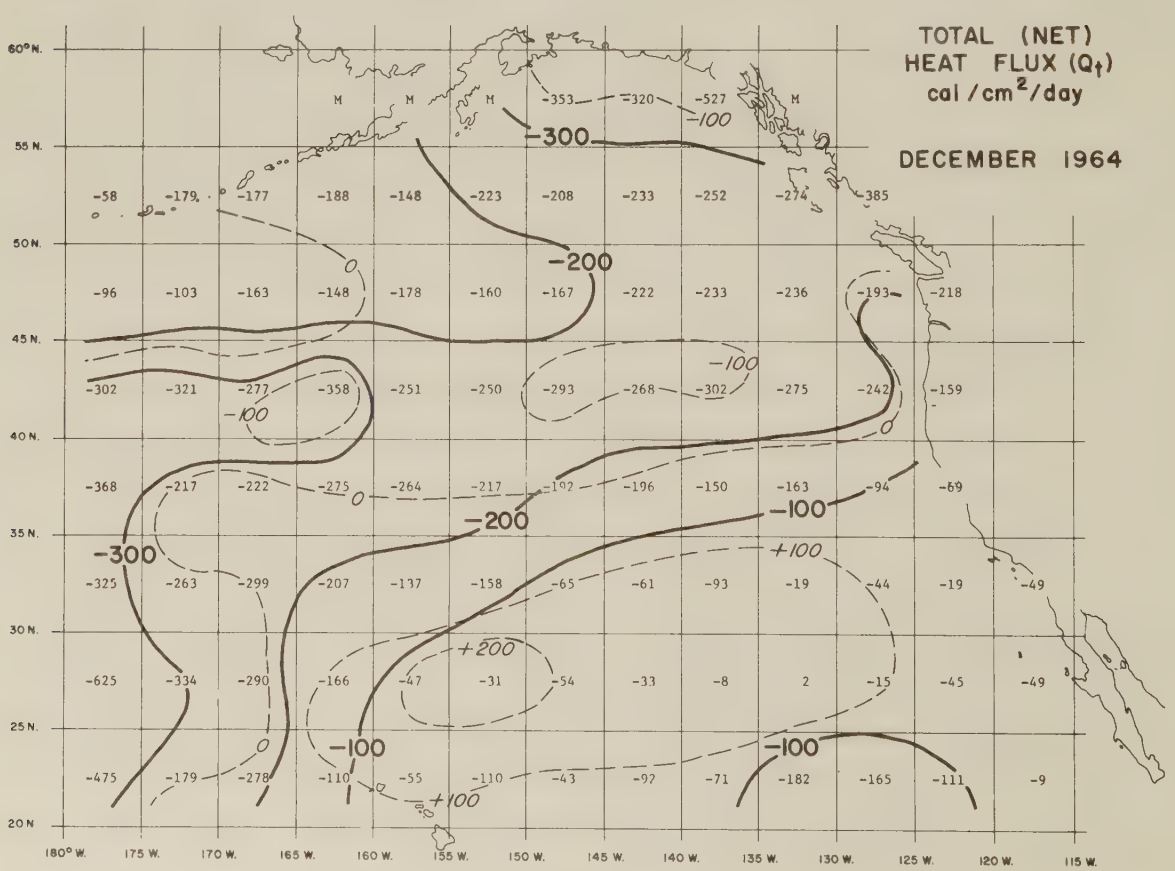

TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
JULY 1964
+200
+300
+200
+300
+100
0
−100
60°N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.

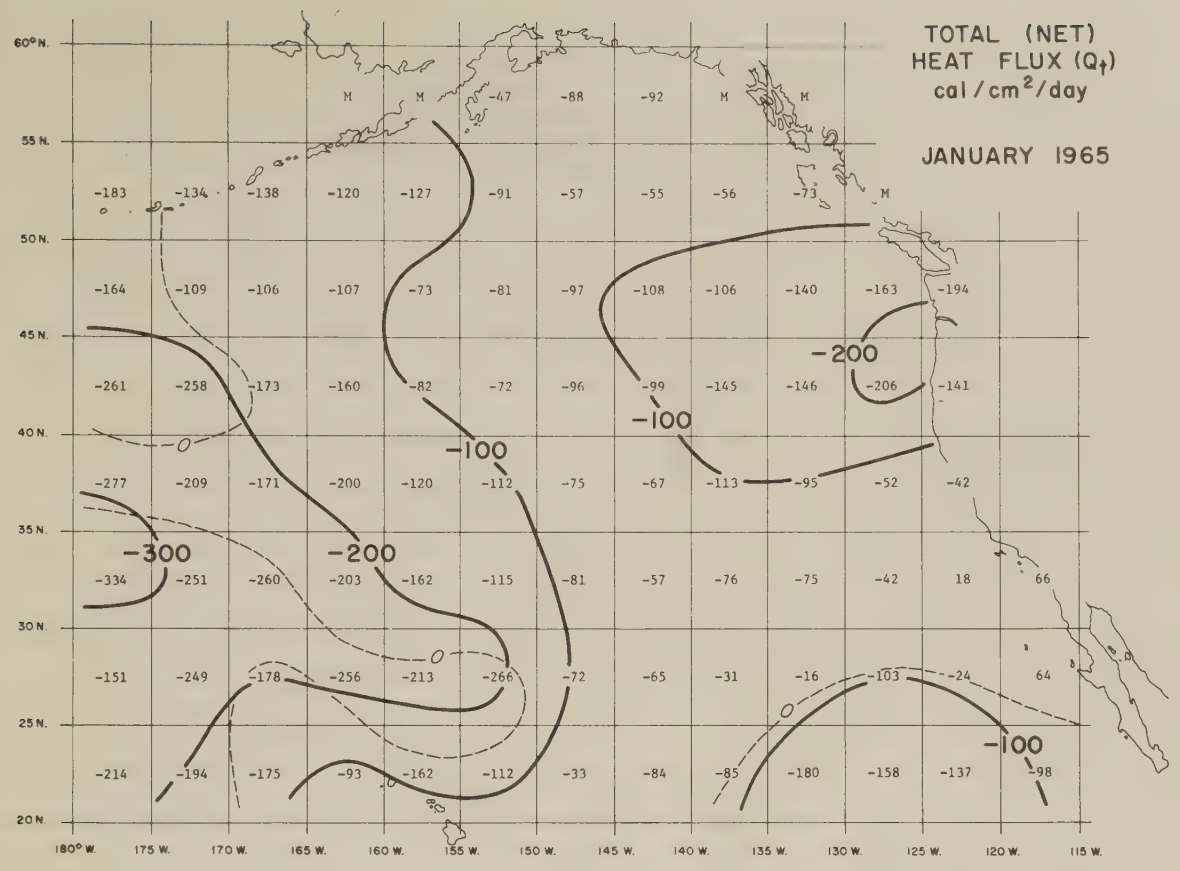

TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
AUGUST 1964
+100
+200
+100
+300
+200
+200
+100
+300
+100
+100
60°N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.

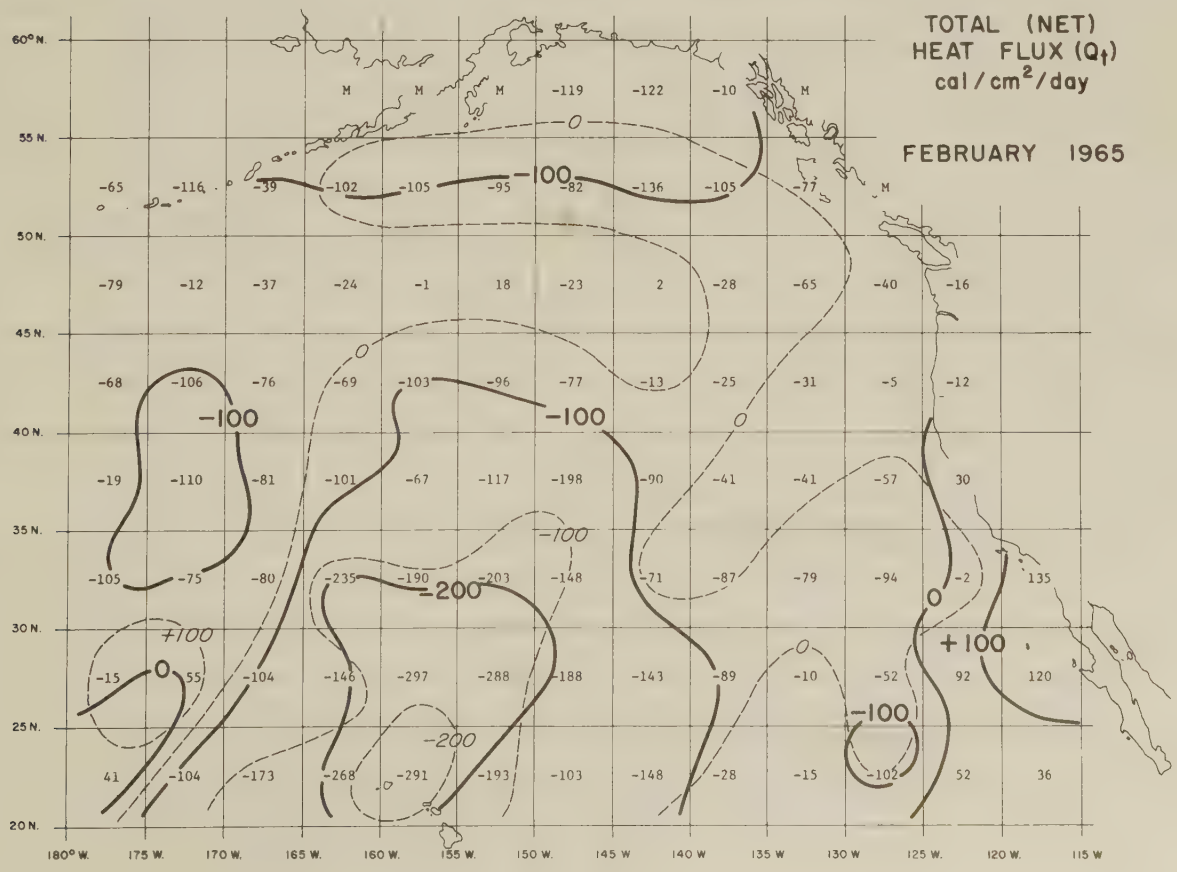

TOTAL (NET)
HEAT FLUX (Q_1)
cal / cm^2 / day
SEPTEMBER 1964
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.

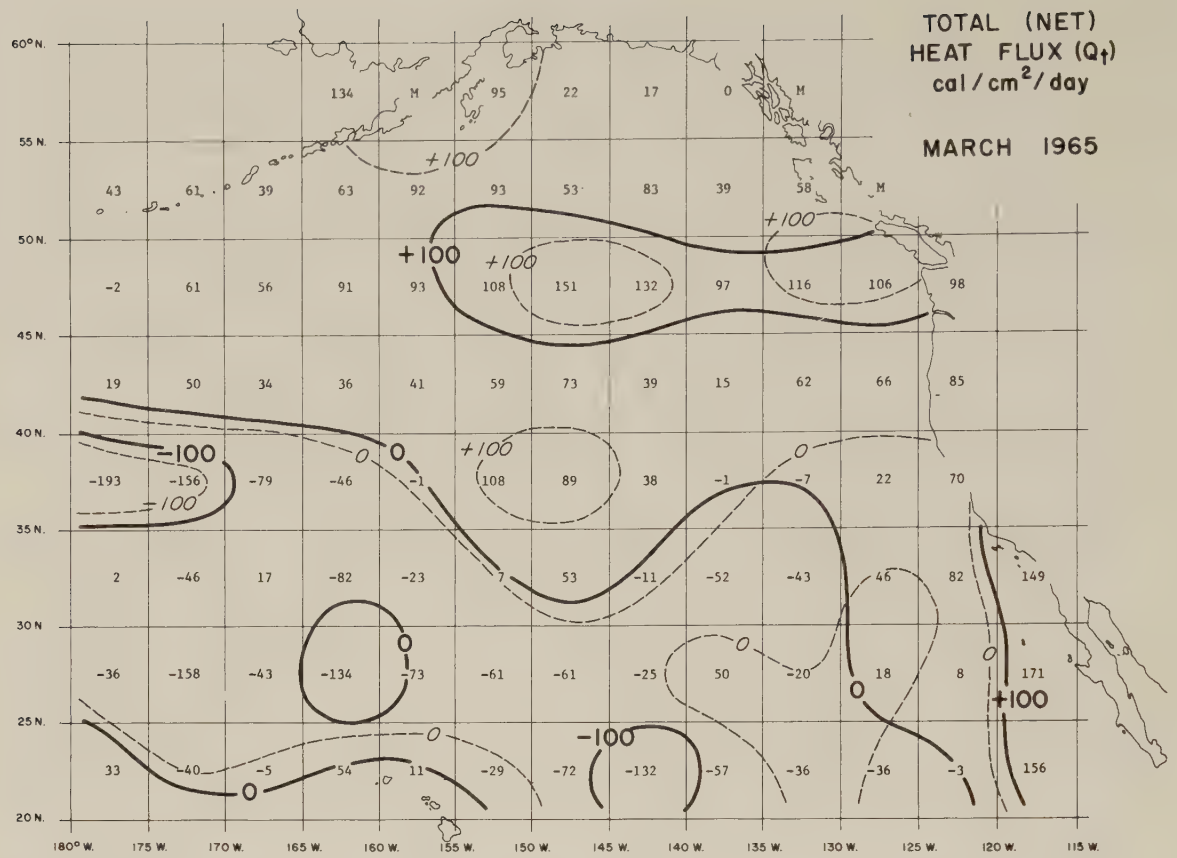

TOTAL (NET)
HEAT FLUX (Q_1)
cal / cm^2 / day
OCTOBER 1964
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.

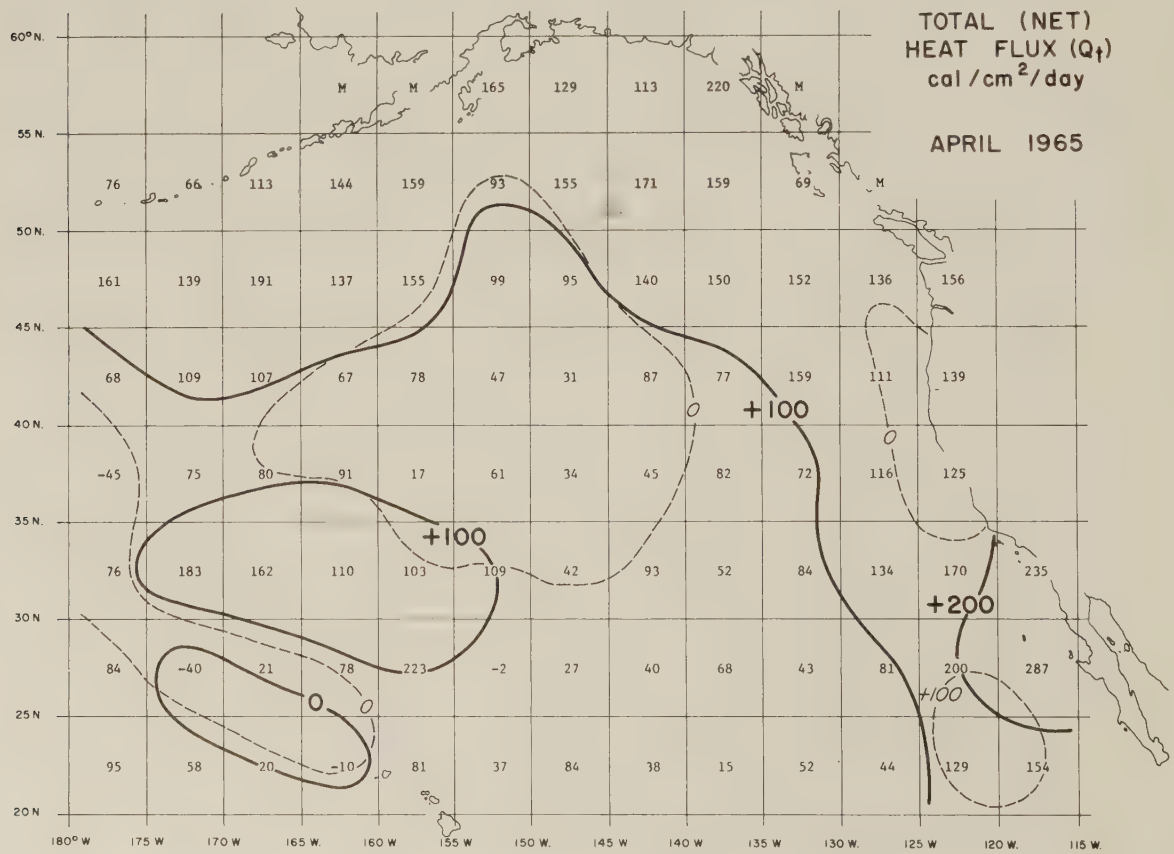

TOTAL (NET)
HEAT FLUX (Q_t)
cal/cm²/day
NOVEMBER 1964
60°N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.

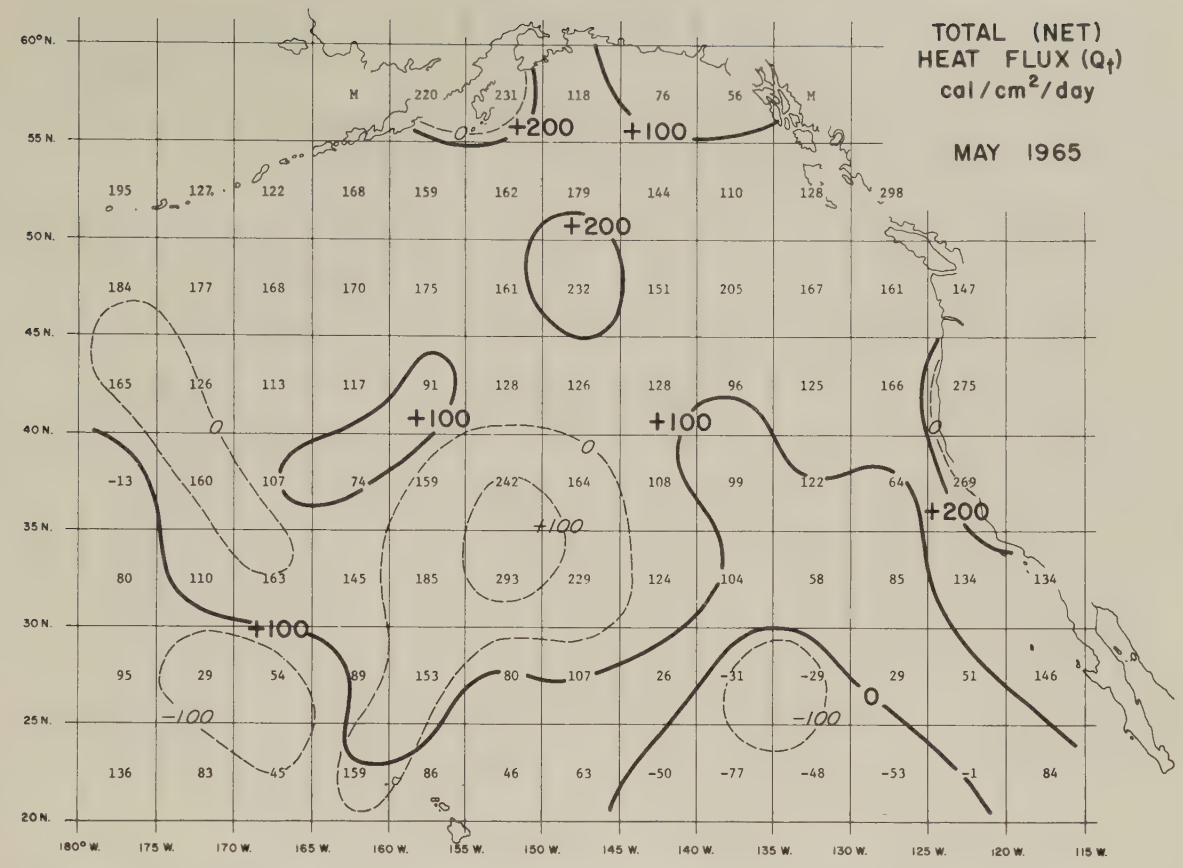

TOTAL (NET)
HEAT FLUX (Q_t)
cal/cm²/day
DECEMBER 1964
60°N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.

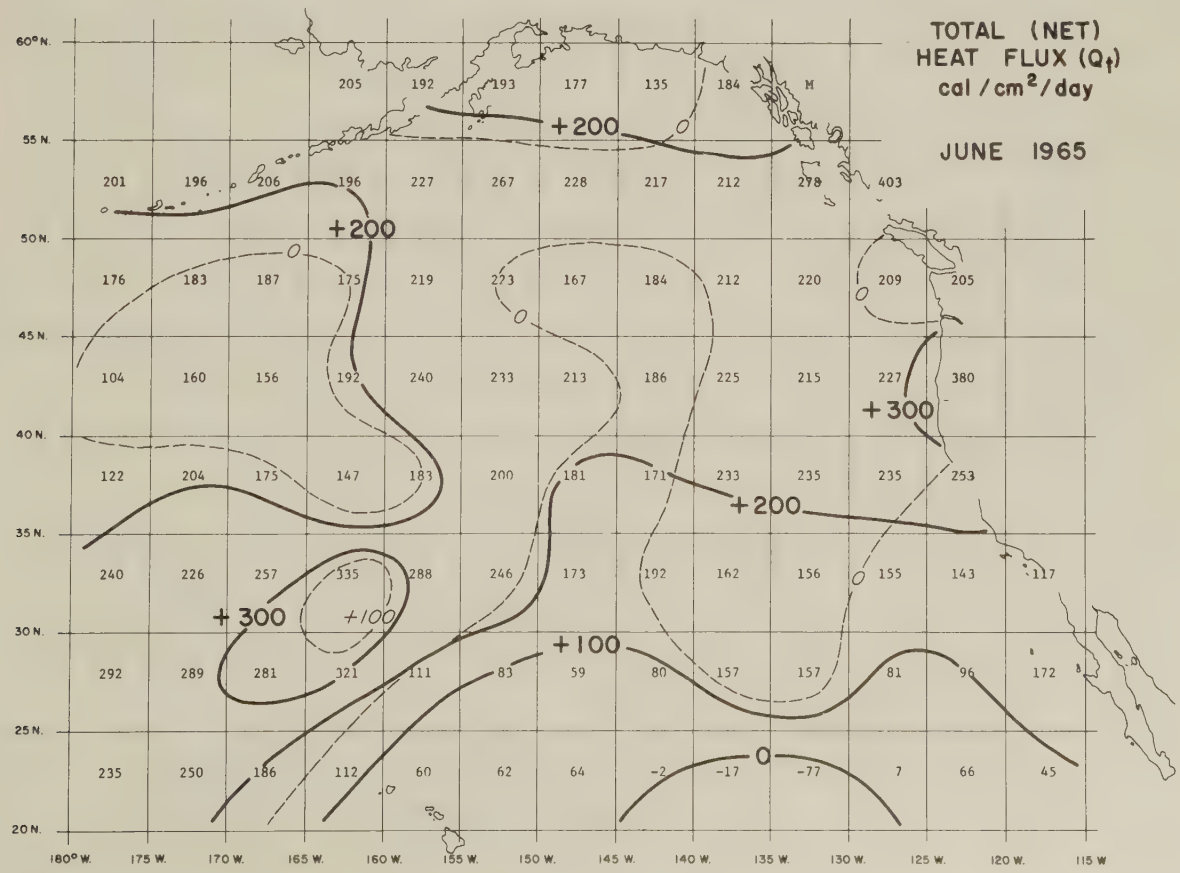

TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
JANUARY 1965
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
-300
-200
-100
0

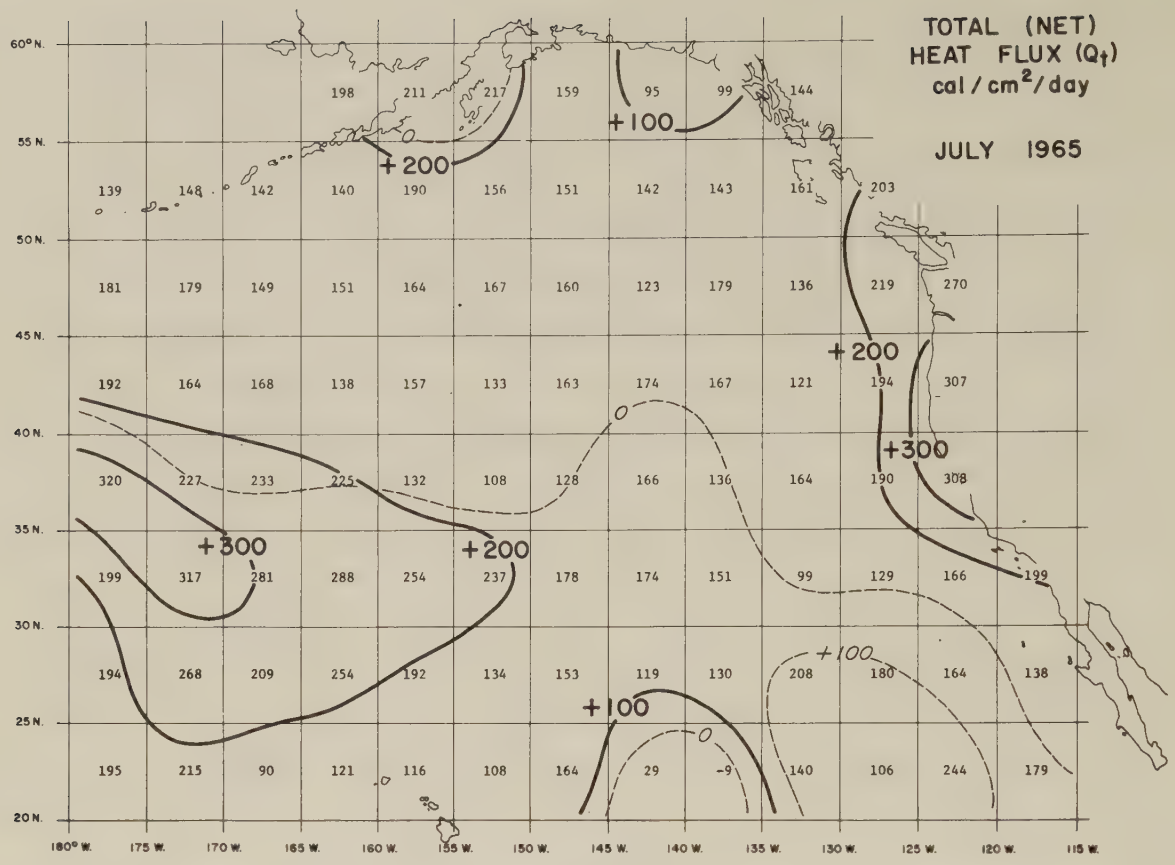

TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
FEBRUARY 1965
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
-200
-100
0
+100

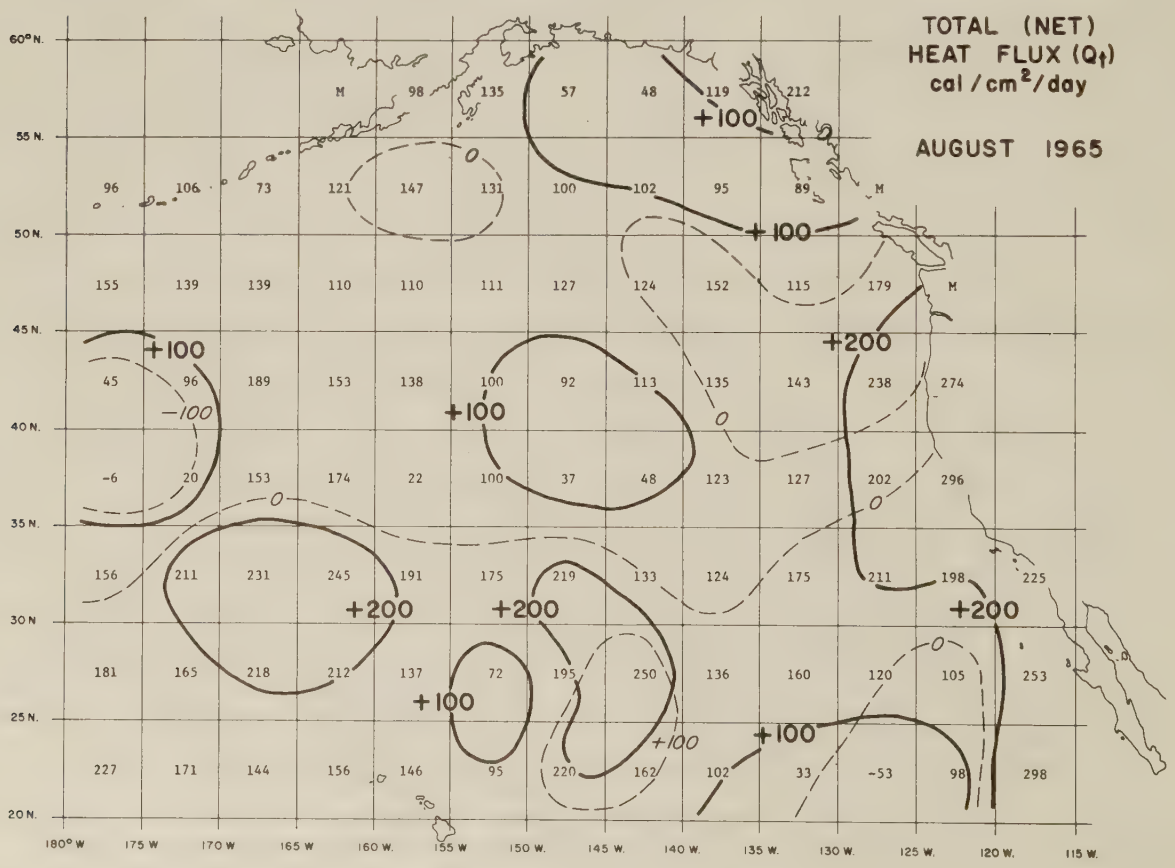

TOTAL (NET)
HEAT FLUX (Qt)
cal / cm² / day
MARCH 1965
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+100
-100
0

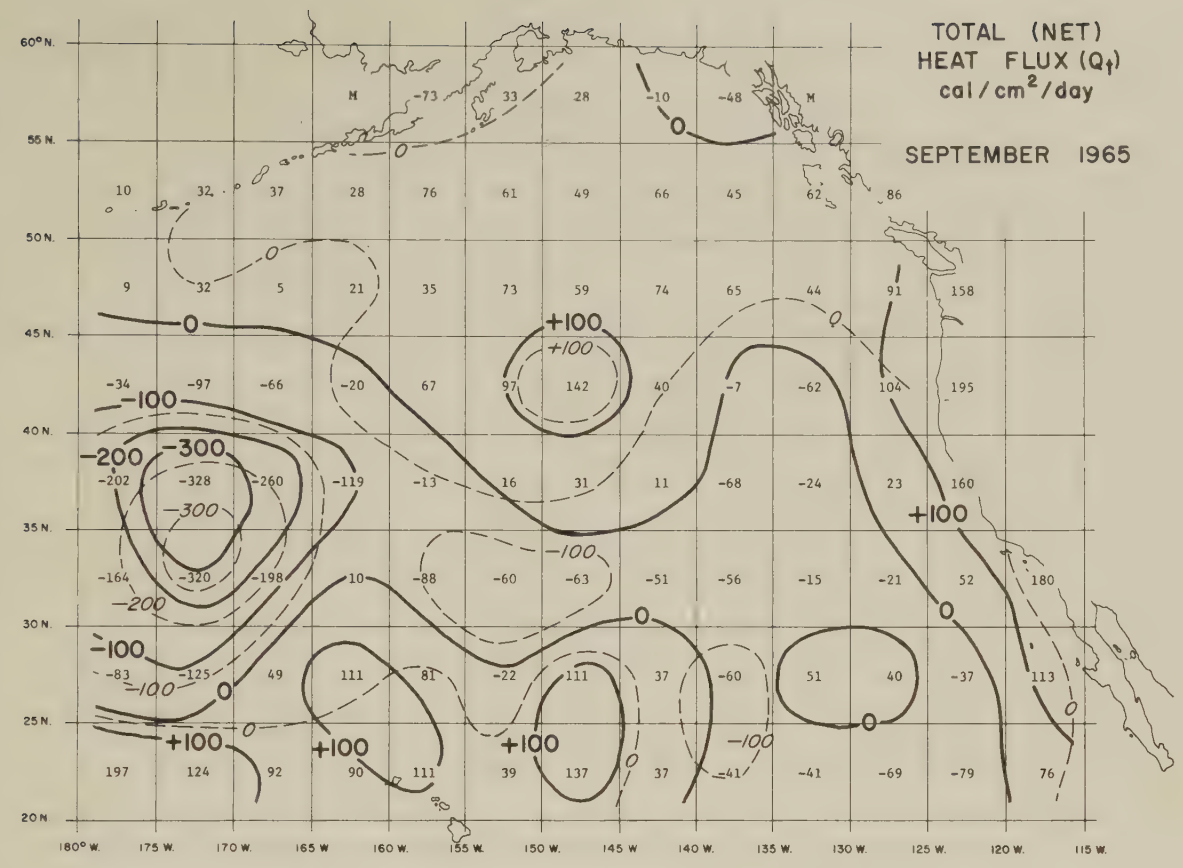

TOTAL (NET)
HEAT FLUX (Qt)
cal / cm² / day
APRIL 1965
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N
25 N.
20 N.
180° W
175 W
170 W.
165 W.
160 W
155 W
150 W.
145 W
140 W
135 W
130 W.
125 W
120 W.
115 W.
+100
+200
0

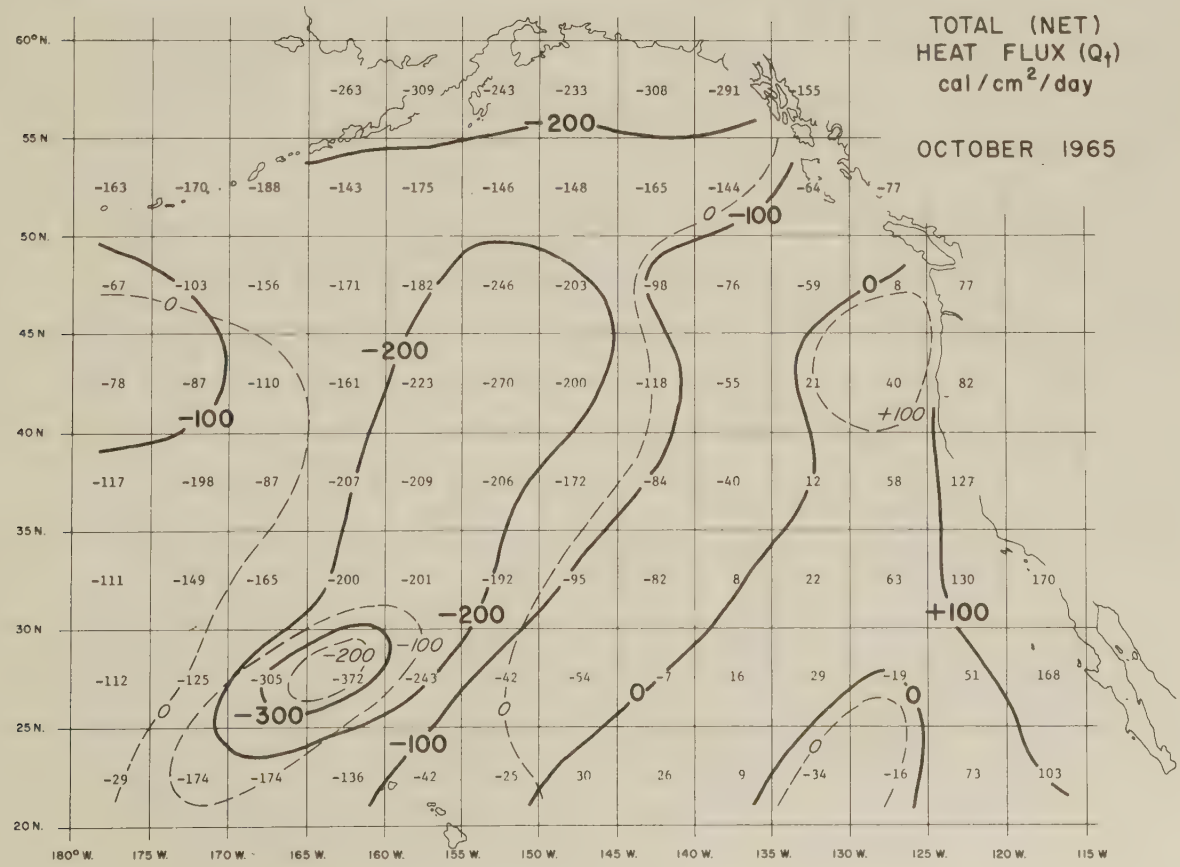

TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
MAY 1965
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+200
+100
0
-100

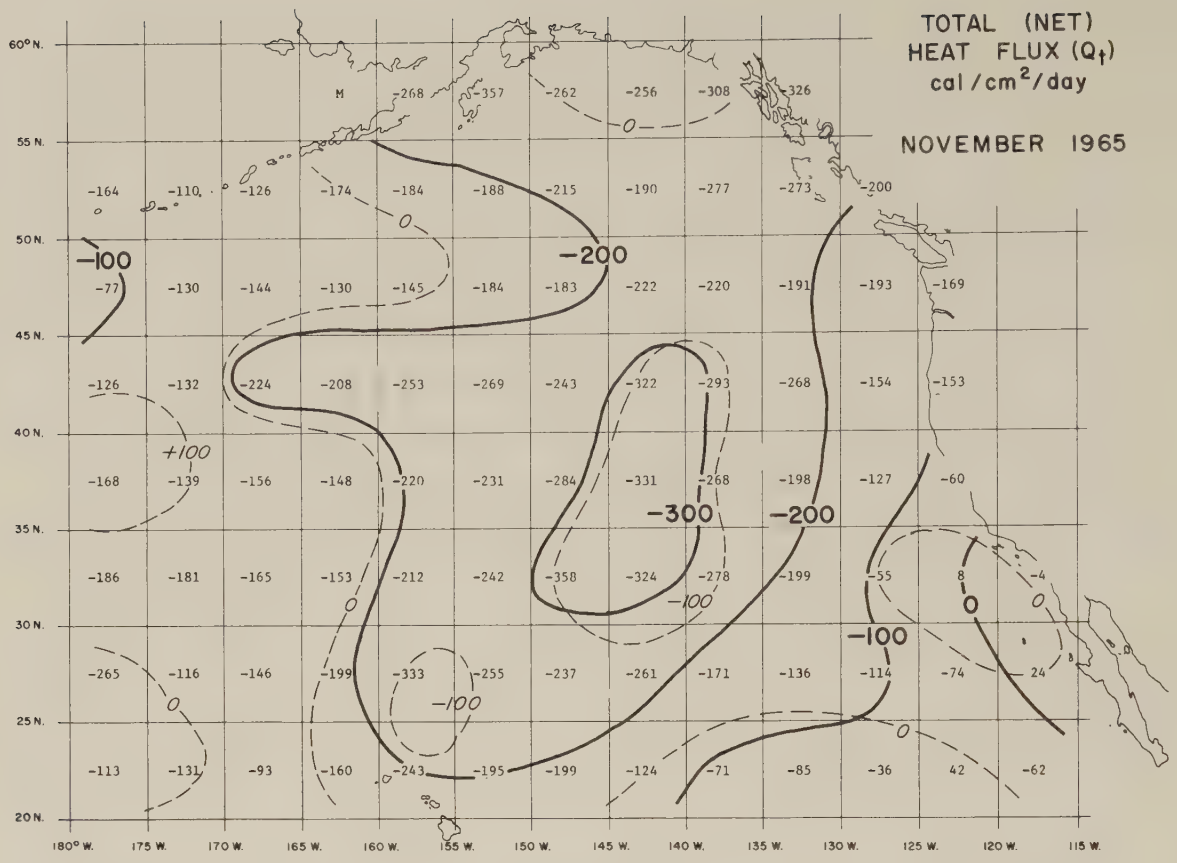

TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
JUNE 1965
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W
+300
+200
+100
0

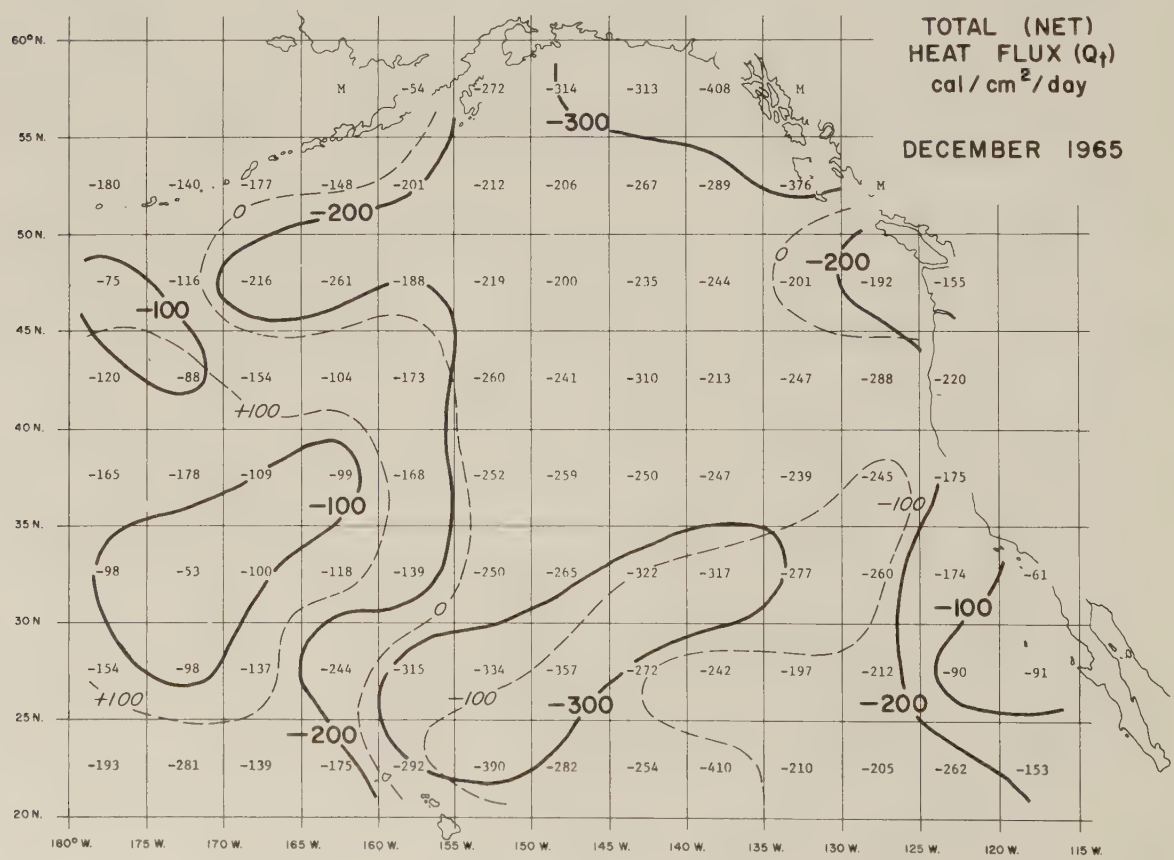

TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
JULY 1965
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
198 211 217 159 95 99 144
139 148 142 140 190 156 151 142 143 161 203
181 179 149 151 164 167 160 123 179 136 219 270
192 164 168 138 157 133 163 174 167 121 194 307
320 227 233 225 132 108 128 166 136 164 190 308
199 317 281 288 254 237 178 174 151 99 129 166 199
194 268 209 254 192 134 153 119 130 208 180 164 138
195 215 90 121 116 108 164 29 -9 140 106 244 179
+100
+200
+300
+200
+300
+200
+100
+100
0
0
0
0

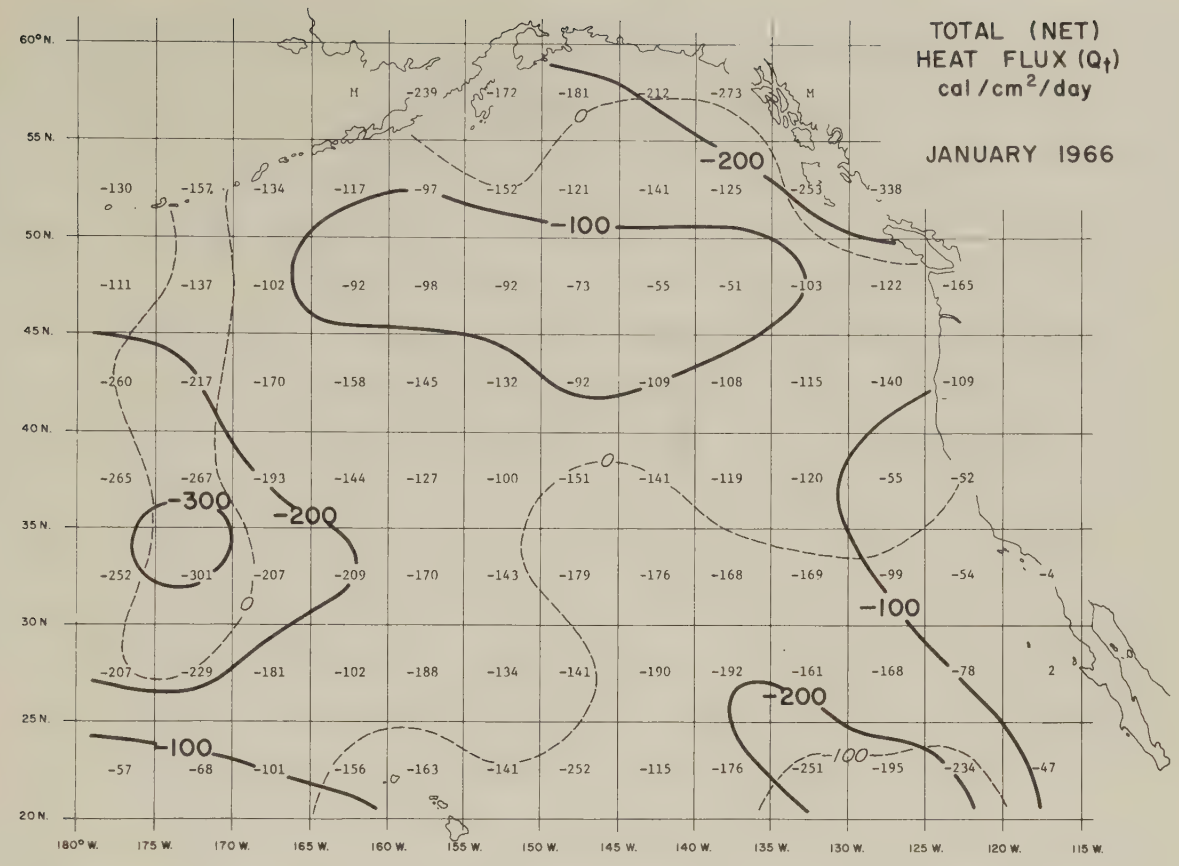

TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
AUGUST 1965
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W
175 W
170 W
165 W
160 W.
155 W
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
M 98 135 57 48 119 212
96 106 73 121 147 131 100 102 95 89 M
155 139 139 110 110 111 127 124 152 115 179 M
45 96 189 153 138 100 92 113 135 143 238 274
-6 20 153 174 22 100 37 48 123 127 202 296
156 211 231 245 191 175 219 133 124 175 211 198 225
181 165 218 212 137 72 195 250 136 160 120 105 253
227 171 144 156 146 95 220 162 102 33 -53 98 298
+100
+100
+100
+200
+100
+200
+200
+200
+100
+100
+100
0
0
0
0
0
0
0
-100


TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
SEPTEMBER 1965
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N
180° W.
175 W.
170 W.
165 W
160 W.
155 W.
150 W.
145 W
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.


TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
OCTOBER 1965
60° N.
55 N
50 N.
45 N
40 N
35 N.
30 N
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W


TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
NOVEMBER 1965
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.


TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
DECEMBER 1965
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.


TOTAL (NET)
HEAT FLUX (Q_t)
cal/cm²/day
JANUARY 1966
60°N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
-200
-100
-300
0
M
-130 -157 -134 -117 -97 -152 -121 -141 -125 -253 -338
-111 -137 -102 -92 -98 -92 -73 -55 -51 -103 -122 -165
-260 -217 -170 -158 -145 -132 -92 -109 -108 -115 -140 -109
-265 -267 -193 -144 -127 -100 -151 -141 -119 -120 -55 -52
-252 -301 -207 -209 -170 -143 -179 -176 -168 -169 -99 -54 -4
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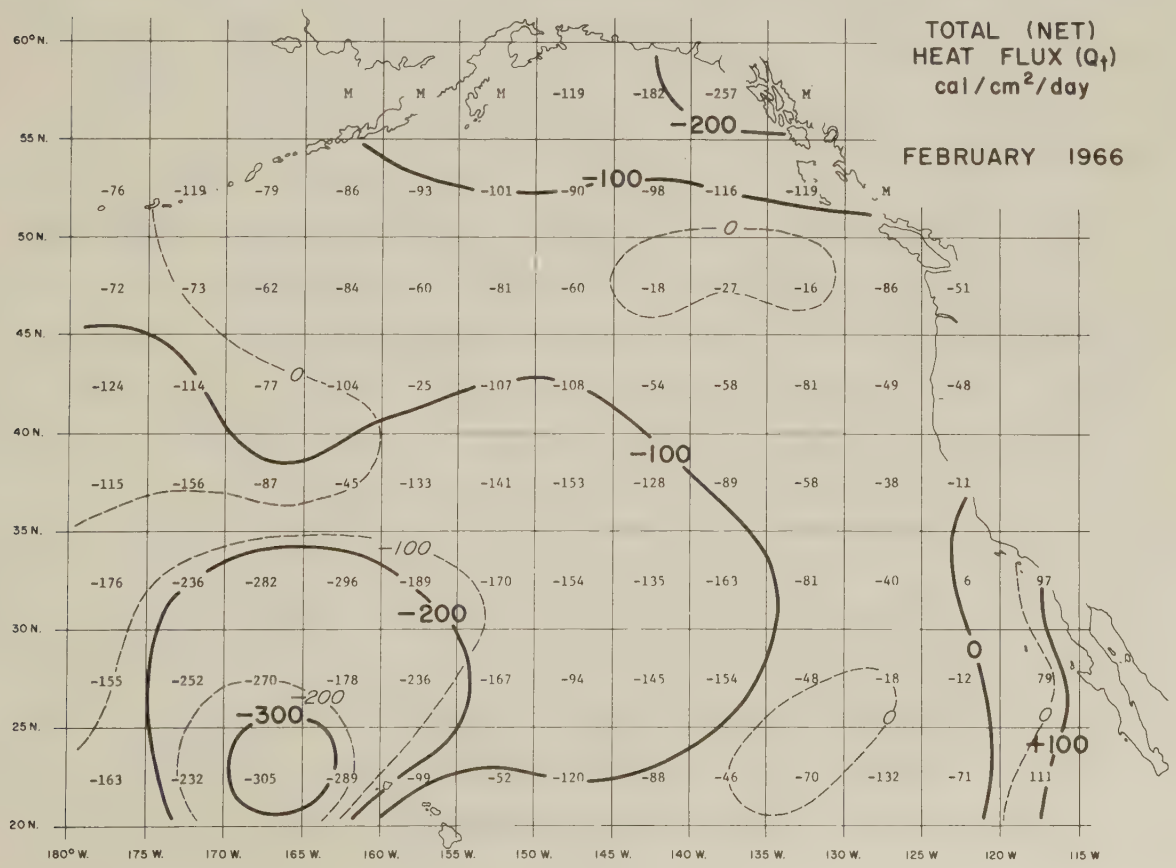
TOTAL (NET)
HEAT FLUX (Q_t)
cal/cm²/day
FEBRUARY 1966
60°N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W
120 W
115 W
-200
-100
-300
0
+100
M
-76 -119 -79 -86 -93 -101 -90 -98 -116 -119
-72 -73 -62 -84 -60 -81 -60 -18 -27 -16 -86 -51
-124 -114 -77 -104 -25 -107 -108 -54 -58 -81 -49 -48
-115 -156 -87 -45 -133 -141 -153 -128 -89 -58 -38 -11
-176 -236 -282 -296 -189 -170 -154 -135 -163 -81 -40 6 97
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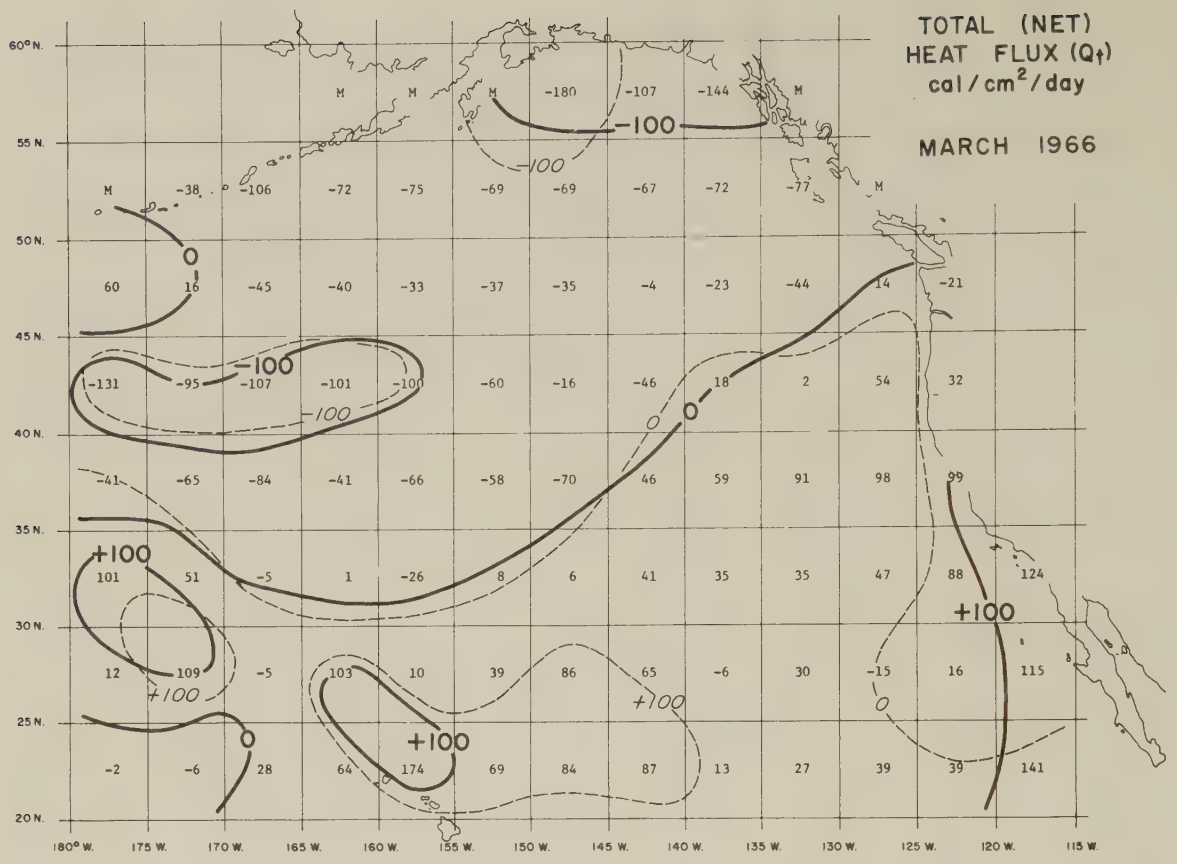
TOTAL (NET)
HEAT FLUX (Q_t)
cal/cm²/day
MARCH 1966
60°N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
M -38 -106 -72 -75 -69 -69 -67 -72 -77 M
60 16 -45 -40 -33 -37 -35 -4 -23 -44 14 -21
-131 -95 -107 -101 -100 -60 -16 -46 18 2 54 32
-41 -65 -84 -41 -66 -58 -70 46 59 91 98 99
101 51 -5 1 -26 8 6 41 35 35 47 88 124
12 109 -5 103 10 39 86 65 -6 30 -15 16 115
-2 -6 28 64 174 69 84 87 13 27 39 39 141
M M M -180 -107 -144 M
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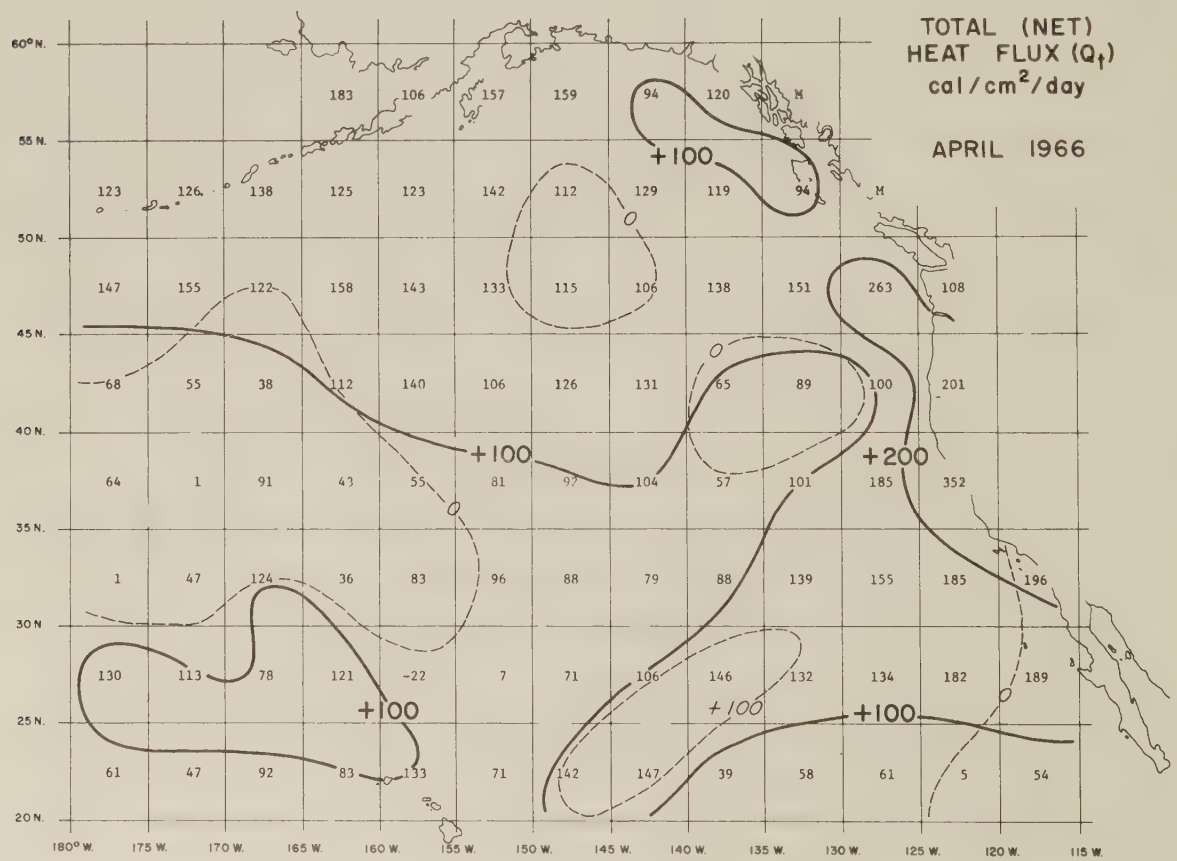
-100
0
-100
-100
0
0
+100
+100
+100
+100
+100
0
0


TOTAL (NET)
HEAT FLUX (Q_t)
cal/cm²/day
APRIL 1966
60°N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
183 106 157 159 94 120 M
123 126 138 125 123 142 112 129 119 94 M
147 155 122 158 143 133 115 106 138 151 263 108
68 55 38 112 140 106 126 131 65 89 100 201
64 1 91 43 55 81 97 104 57 101 185 352
1 47 124 36 83 96 88 79 88 139 155 185 196
130 113 78 121 -22 7 71 106 146 132 134 182 189
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+100
+100
+200
+100
+100
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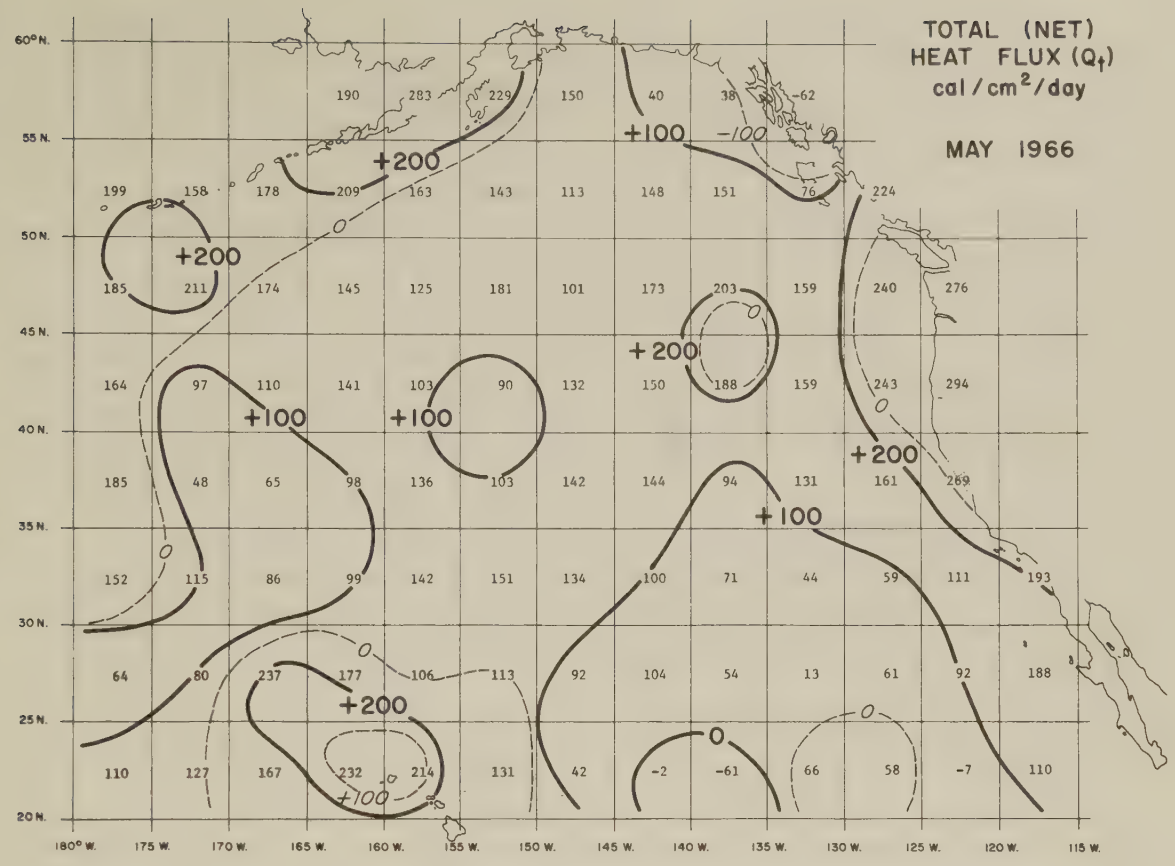
0
0
0
0


TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
MAY 1966
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+200
+100
-100
0
190 283 229 150 40 38 -62
199 158 178 209 163 143 113 148 151 76 224
185 211 174 145 125 181 101 173 203 159 240 276
164 97 110 141 103 90 132 150 188 159 243 294
185 48 65 98 136 103 142 144 94 131 161 269
152 115 86 99 142 151 134 100 71 44 59 111 193
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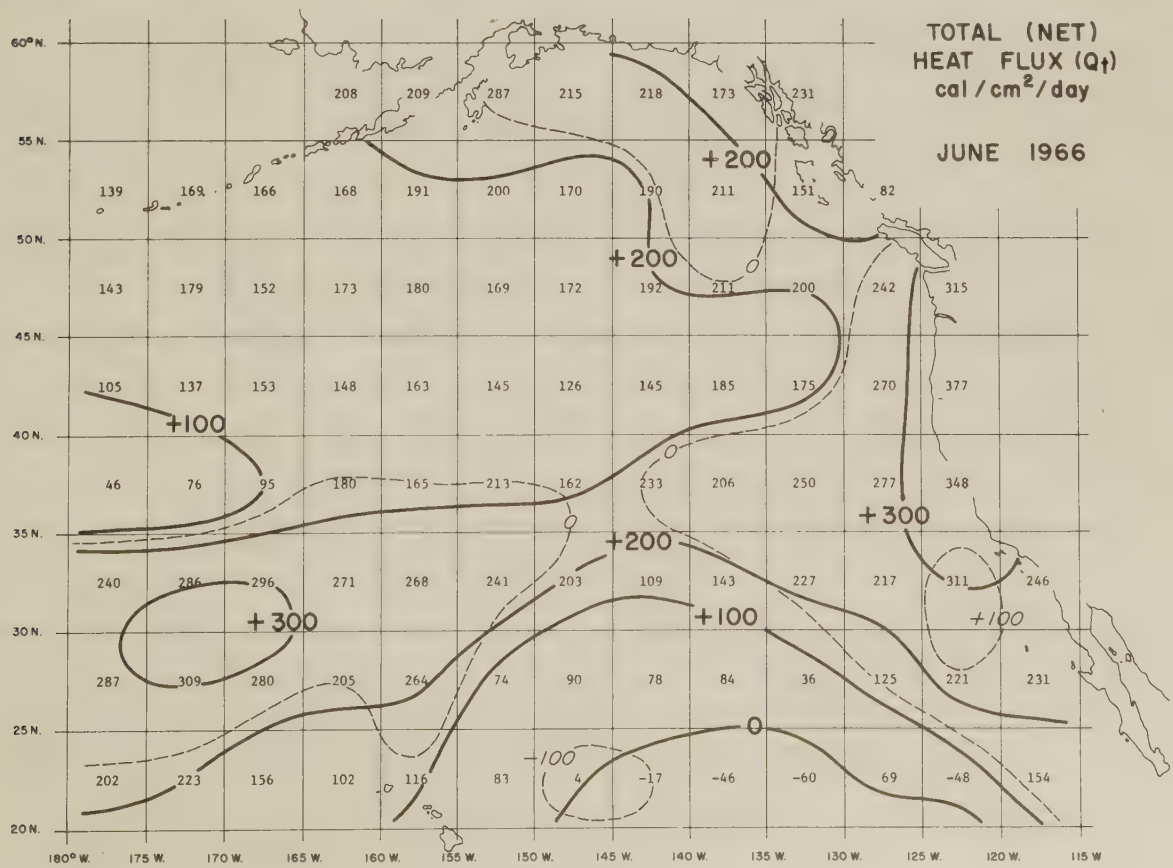
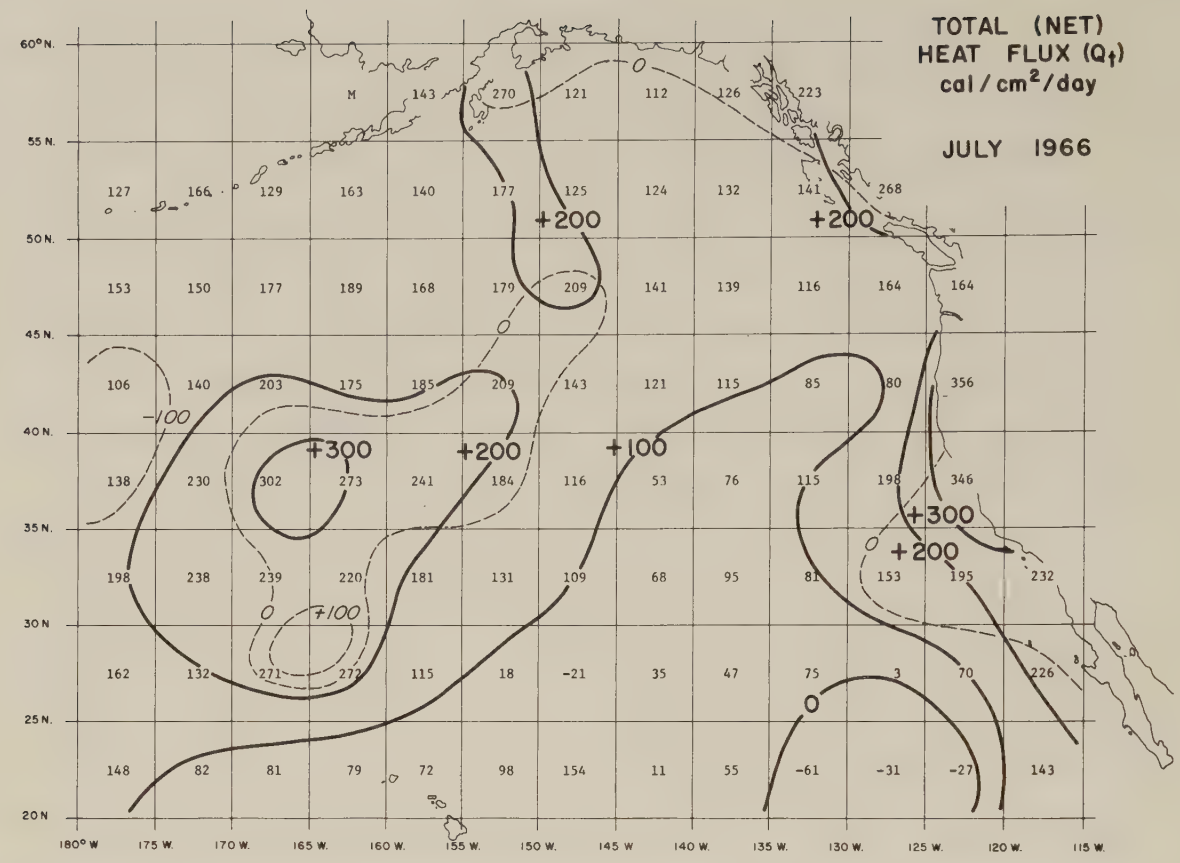
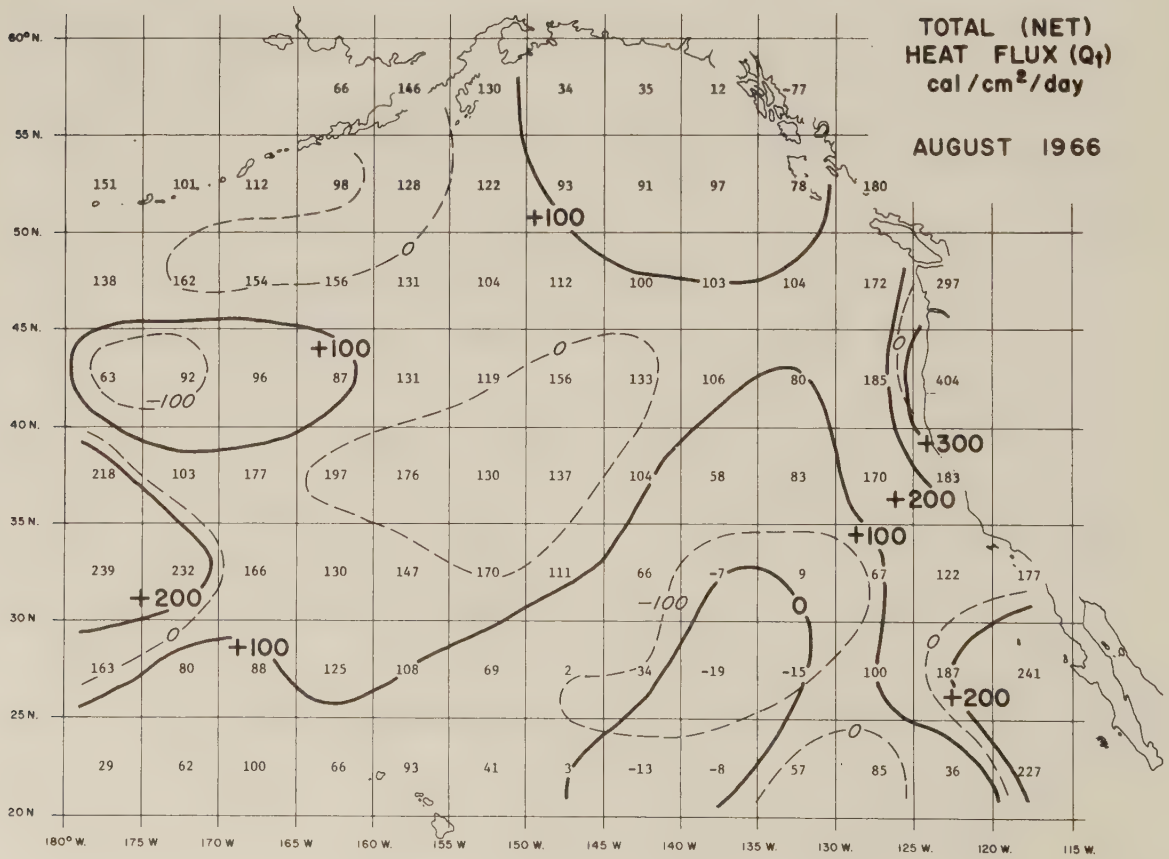
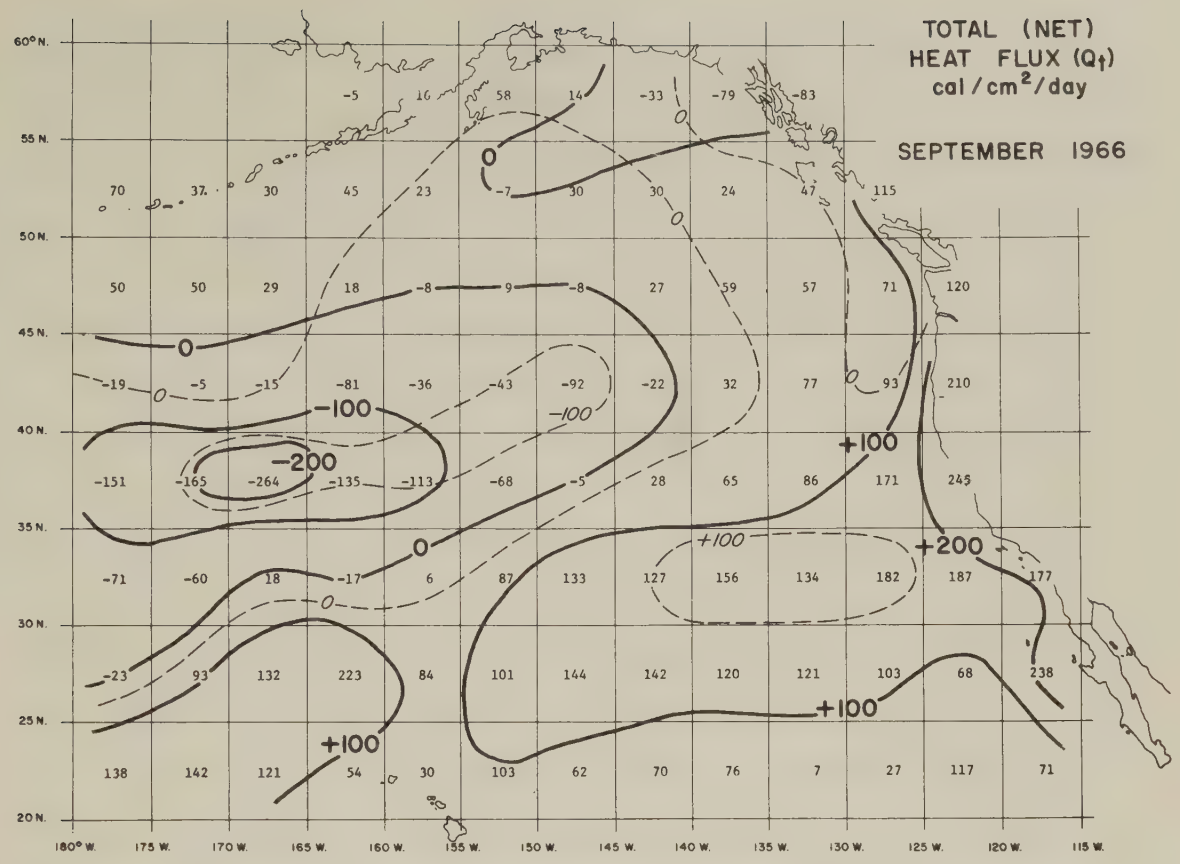
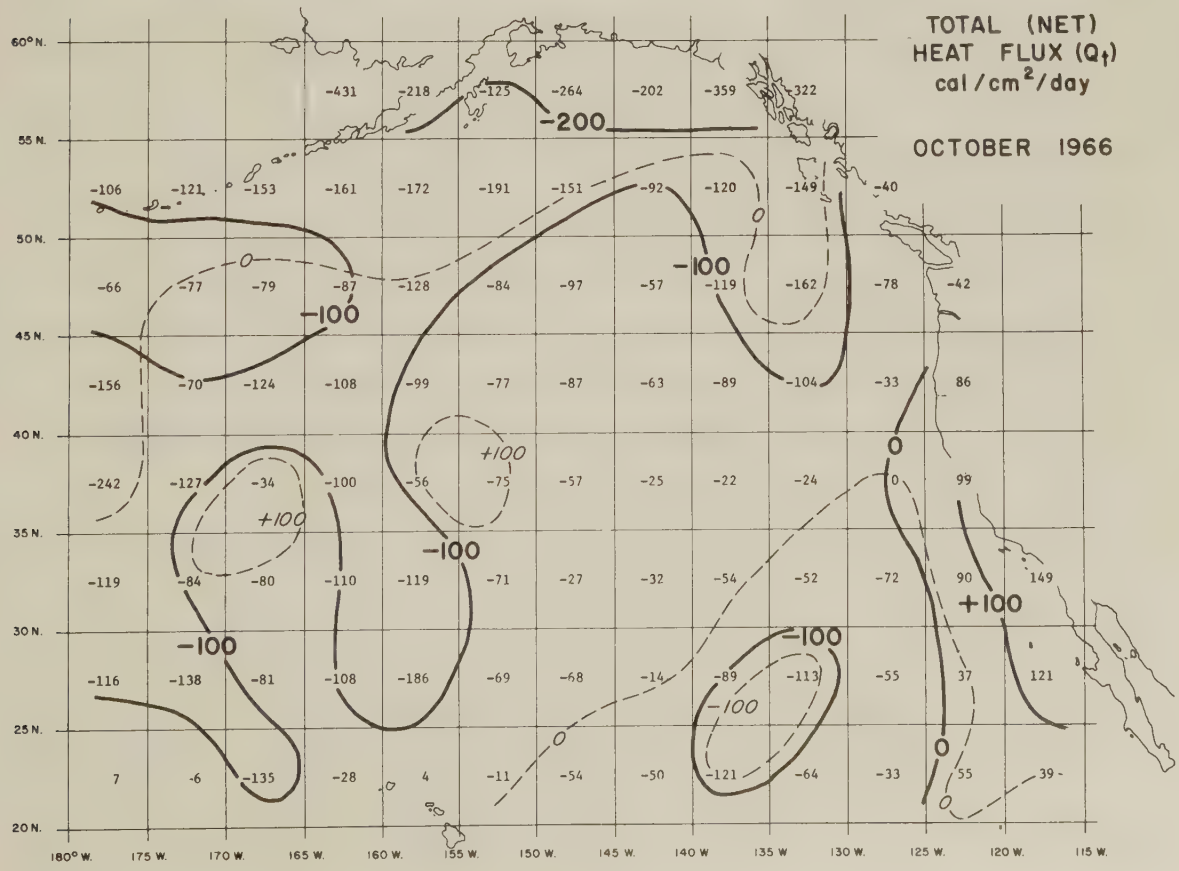
110 127 167 232 214 131 42 -2 -61 66 58 -7 110

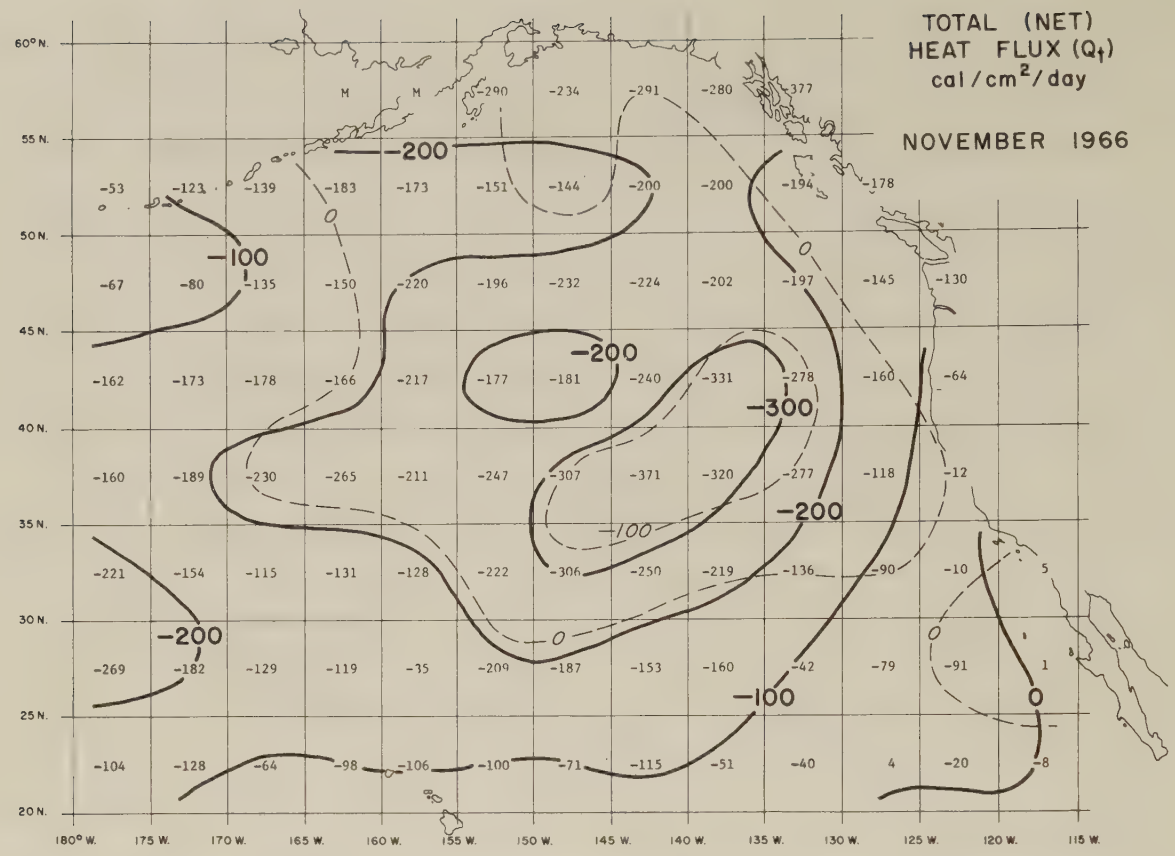

TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
JUNE 1966
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W
+300
+200
+100
0
-100
208 209 287 215 218 173 231
139 169 166 168 191 200 170 190 211 151 82
143 179 152 173 180 169 172 192 211 200 242 315
105 137 153 148 163 145 126 145 185 175 270 377
46 76 95 180 165 213 162 233 206 250 277 348
240 286 296 271 268 241 203 109 143 227 217 311 246
287 309 280 205 264 74 90 78 84 36 125 221 231
202 223 156 102 116 83 4 -17 -46 -60 69 -48 154

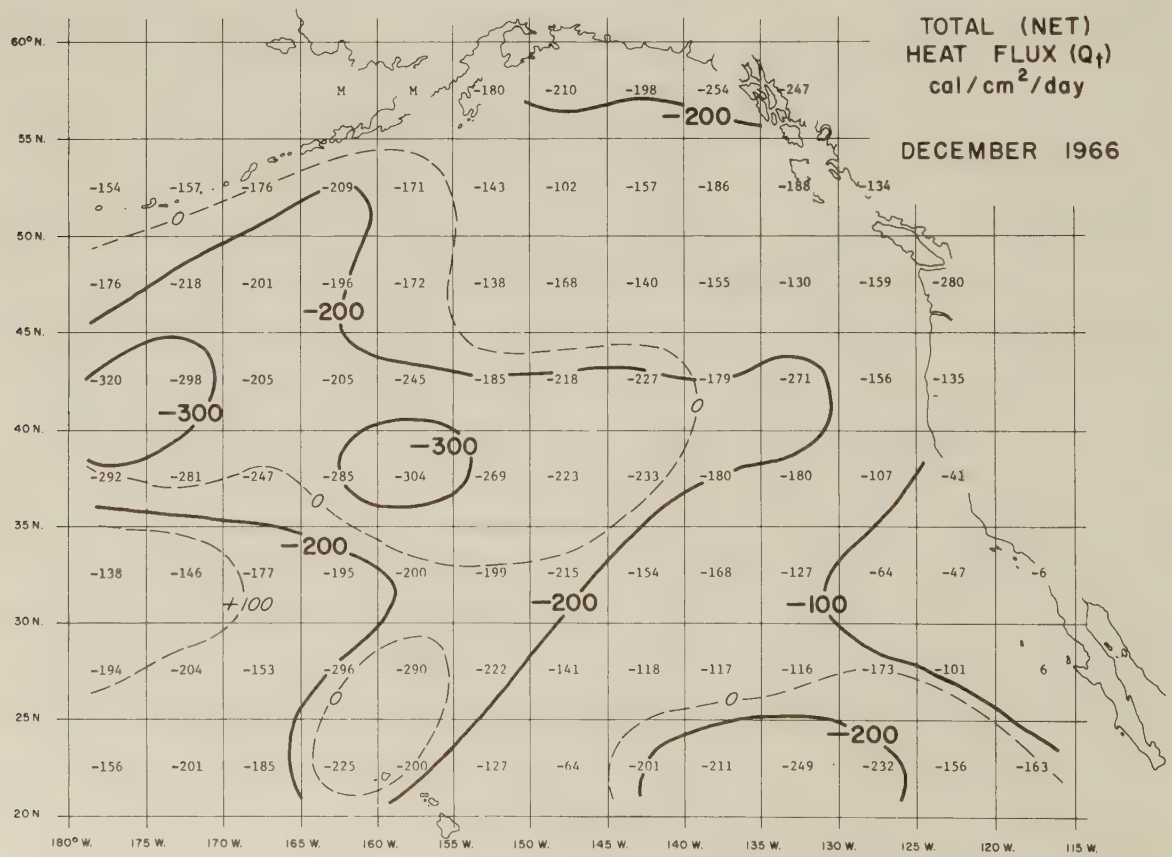

TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm² / day
JULY 1966
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N
25 N.
20 N
180° W
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+200
+300
+100
0
-100


TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm² / day
AUGUST 1966
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N
25 N.
20 N
180° W.
175 W
170 W
165 W
160 W.
155 W
150 W.
145 W
140 W
135 W.
130 W.
125 W.
120 W.
115 W.
+100
+200
+300
0
-100


TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
SEPTEMBER 1966
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
0
-100
-200
+100
+200


TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
OCTOBER 1966
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
0
-100
-200
+100


TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
NOVEMBER 1966
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
-200
-100
-200
-300
-200
-100
-200
0
0
0
0
0
M M -290 -234 -291 -280 -377
-53 -121 -139 -183 -173 -151 -144 -200 -200 -194 -178
-67 -80 -135 -150 -220 -196 -232 -224 -202 -197 -145 -130
-162 -173 -178 -166 -217 -177 -181 -240 -331 -278 -160 -64
-160 -189 -230 -265 -211 -247 -307 -371 -320 -277 -118 -12
-221 -154 -115 -131 -128 -222 -306 -250 -219 -136 -90 -10 5
-269 -182 -129 -119 -35 -209 -187 -153 -160 -42 -79 -91 1
-104 -128 -64 -98 -106 -100 -71 -115 -51 -40 4 -20 -8


TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
DECEMBER 1966
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N
20 N
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
-200
-200
-300
-300
-200
+100
-200
-100
-200
0
0
0
0
0
M M -180 -210 -198 -254 -247
-154 -157 -176 -209 -171 -143 -102 -157 -186 -188 -134
-176 -218 -201 -196 -172 -138 -168 -140 -155 -130 -159 -280
-320 -298 -205 -205 -245 -185 -218 -227 -179 -271 -156 -135
-292 -281 -247 -285 -304 -269 -223 -233 -180 -180 -107 -41
-138 -146 -177 -195 -200 -199 -215 -154 -168 -127 -64 -47 -6
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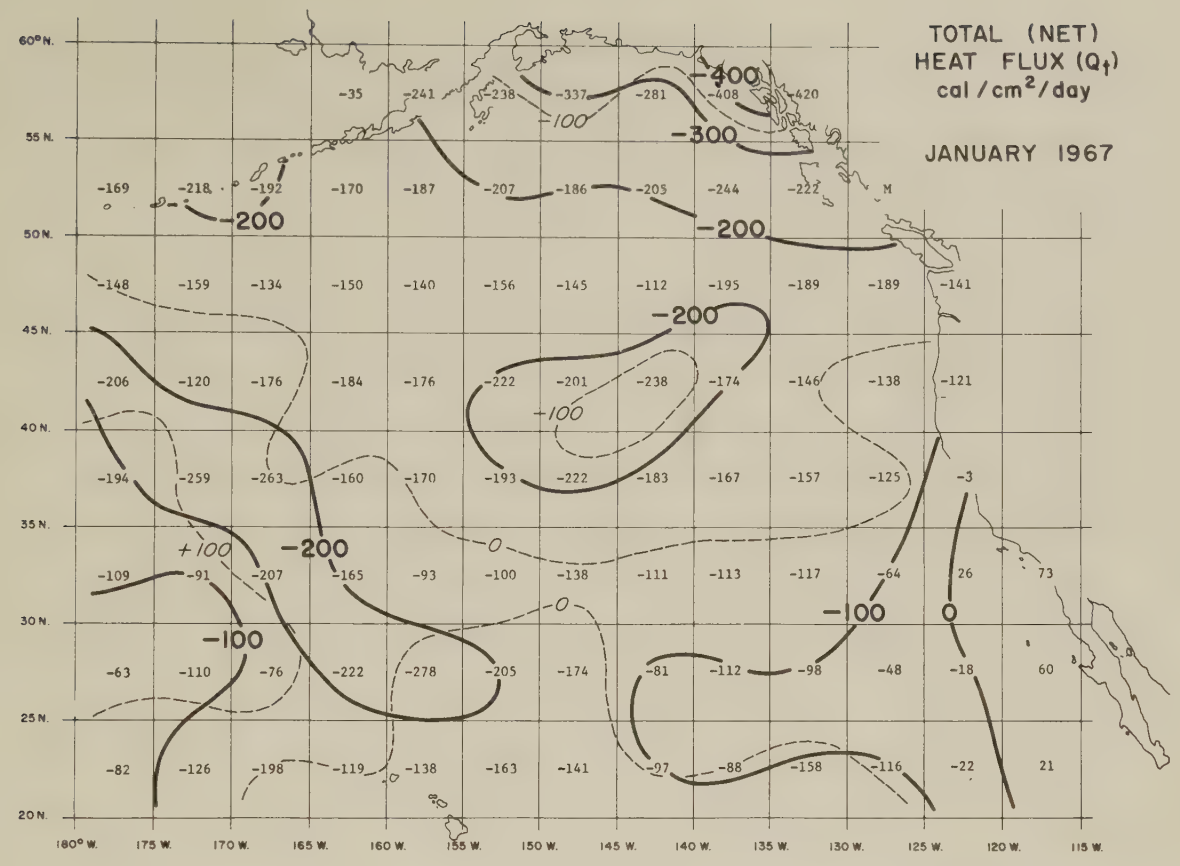
TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
JANUARY 1967
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
-400
-300
-200
-100
0
+100
-35 -241 -238 -337 -281 -408 -420
-169 -218 -192 -170 -187 -207 -186 -205 -244 -222 M
-148 -159 -134 -150 -140 -156 -145 -112 -195 -189 -189 -141
-206 -120 -176 -184 -176 -222 -201 -238 -174 -146 -138 -121
-194 -259 -263 -160 -170 -193 -222 -183 -167 -157 -125 -3
-109 -91 -207 -165 -93 -100 -138 -111 -113 -117 -64 26 73
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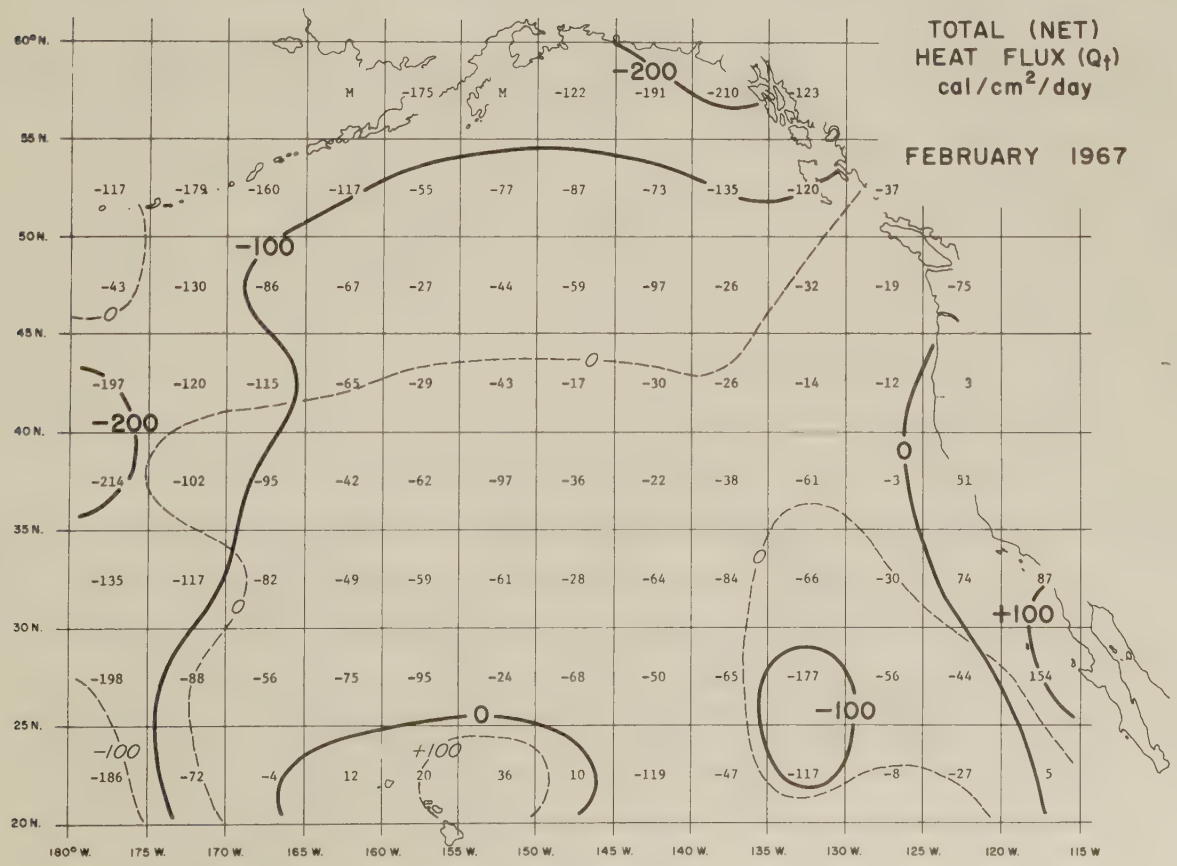
TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
FEBRUARY 1967
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W
-200
-100
0
+100
M -175 M -122 -191 -210 -123
-117 -179 -160 -117 -55 -77 -87 -73 -135 -120 -37
-43 -130 -86 -67 -27 -44 -59 -97 -26 -32 -19 -75
-197 -120 -115 -65 -29 -43 -17 -30 -26 -14 -12 3
-214 -102 -95 -42 -62 -97 -36 -22 -38 -61 -3 51
-135 -117 -82 -49 -59 -61 -28 -64 -84 -66 -30 74 87
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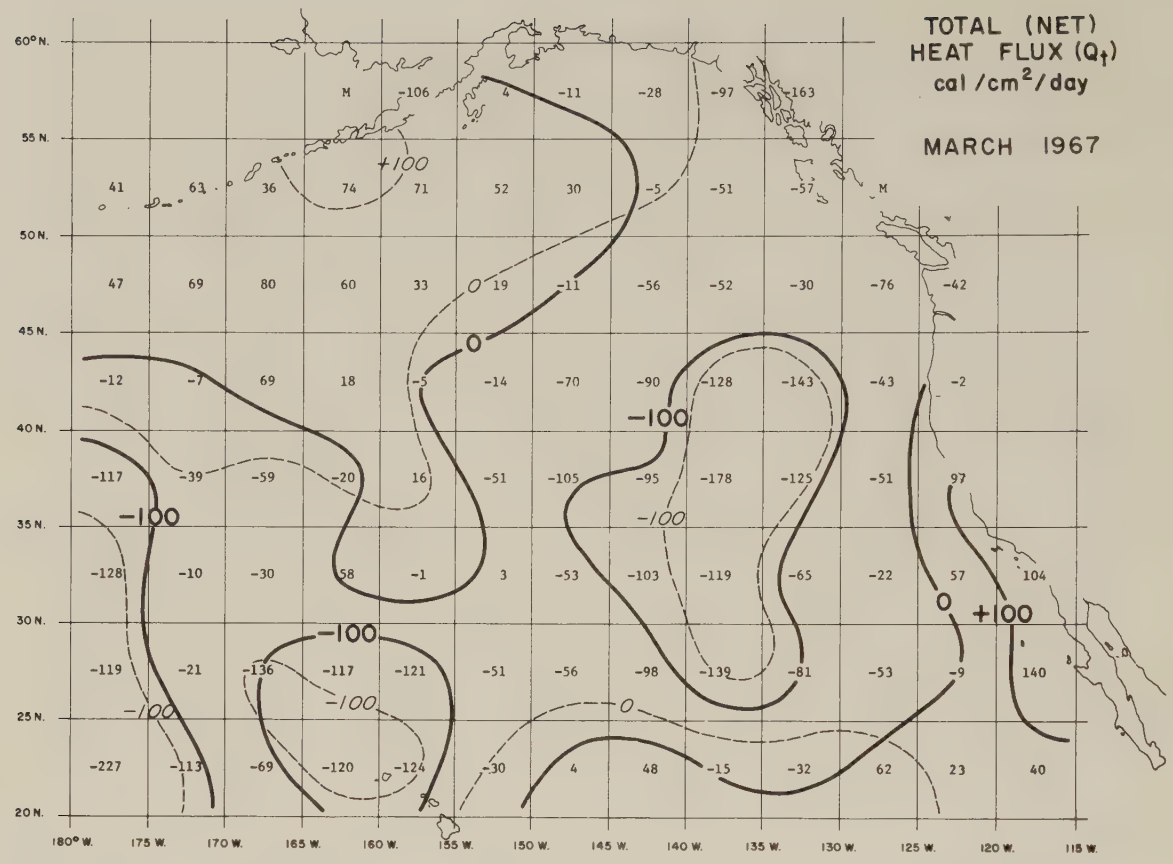
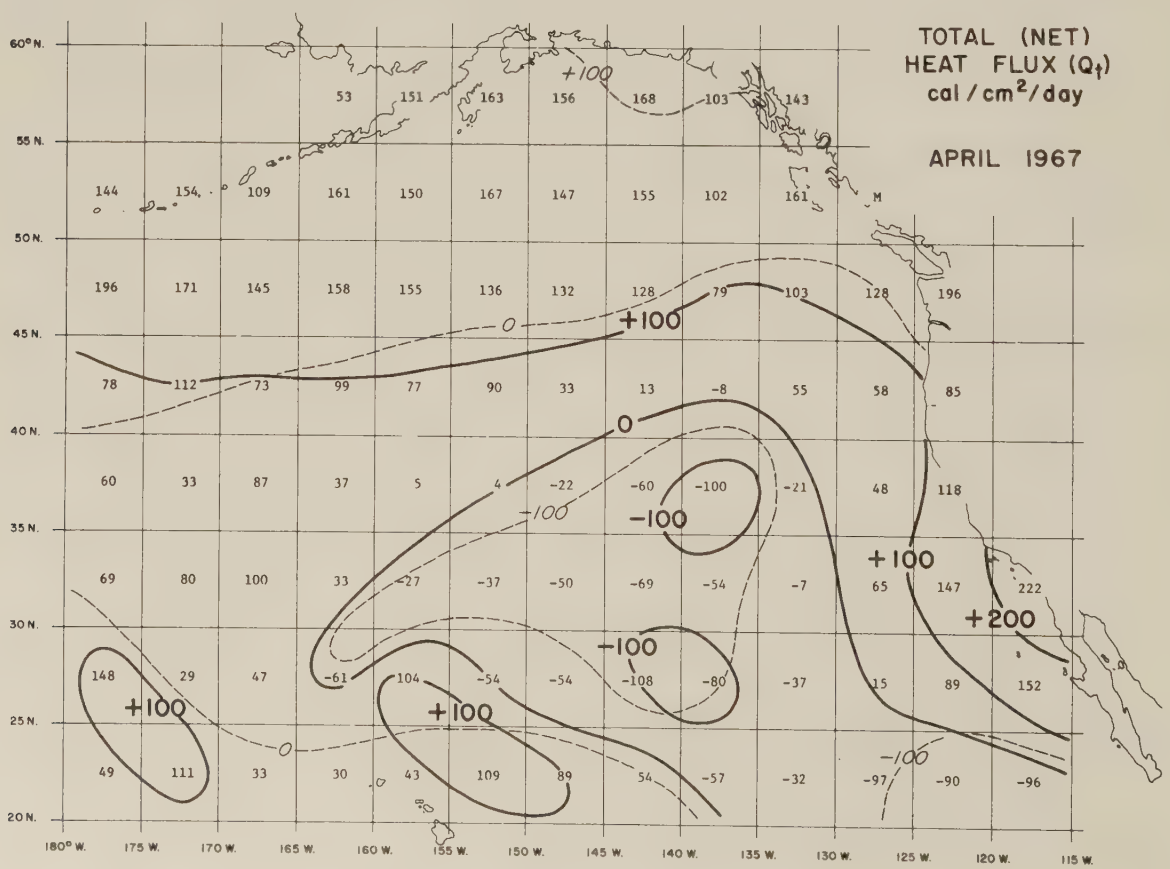

TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
MARCH 1967
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+100
0
-100
-100
-100
-100
0
0
+100


TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
APRIL 1967
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+100
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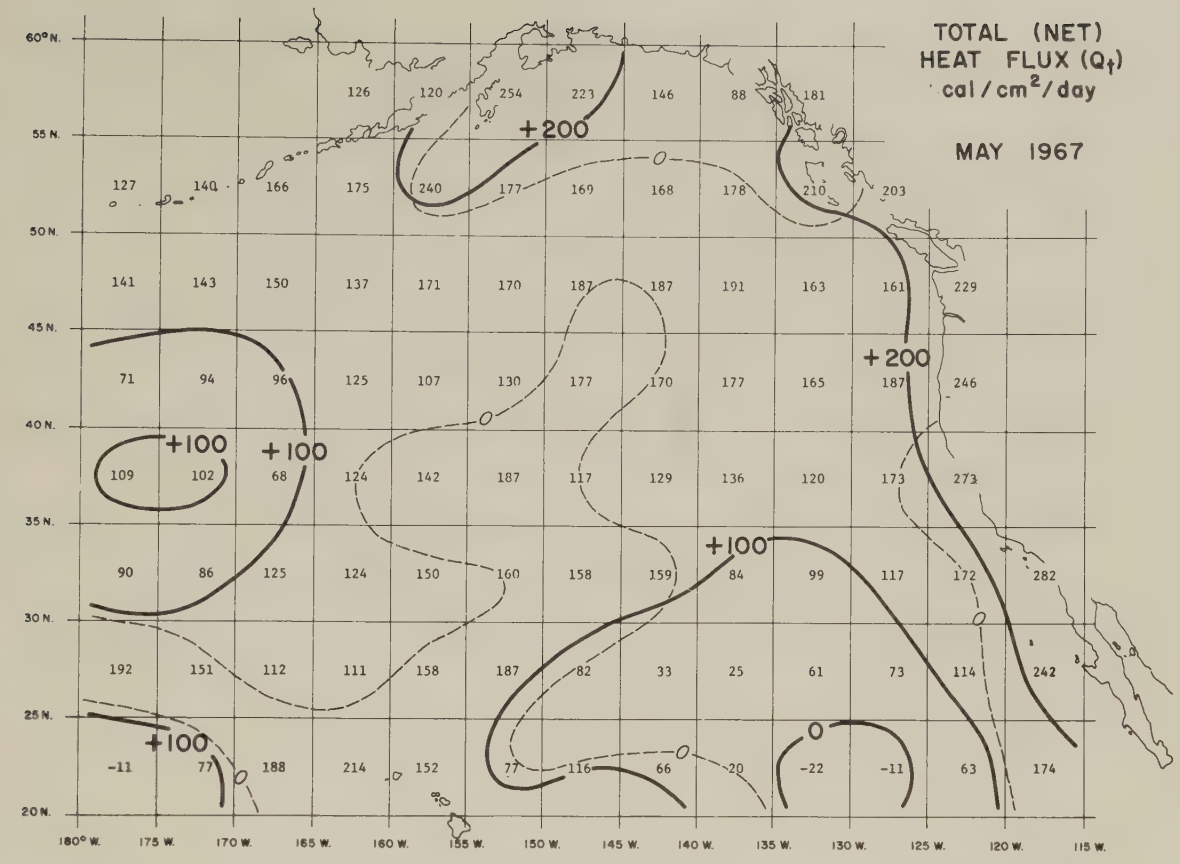
+100
0
-100
-100
+100
+100
+200
-100
0
-100


TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm² / day
MAY 1967
60°N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+200
+100
+100
+100
+200
+100
0
126 120 254 223 146 88 181
127 140 166 175 240 177 169 168 178 210 203
141 143 150 137 171 170 187 187 191 163 161 229
71 94 96 125 107 130 177 170 177 165 187 246
109 102 68 124 142 187 117 129 136 120 173 273
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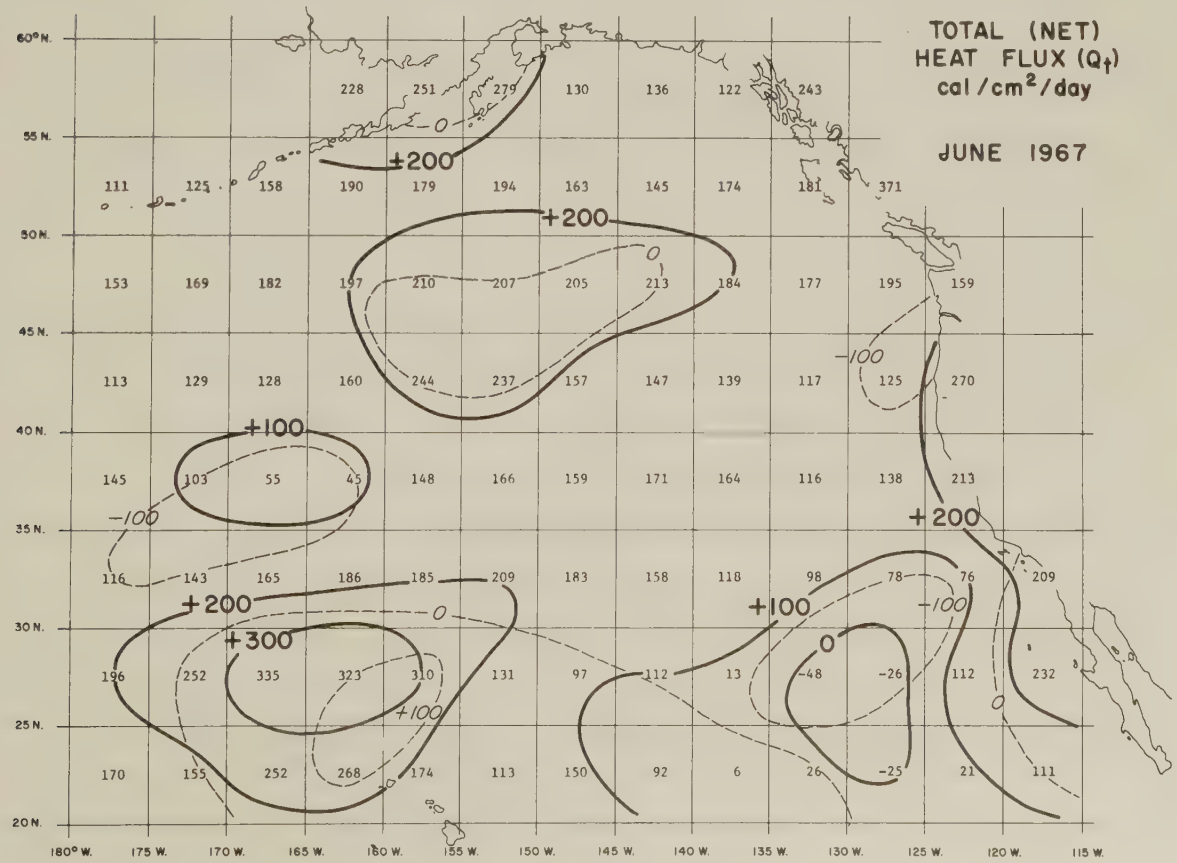
-11 77 188 214 152 77 116 66 20 -22 -11 63 174


TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm² / day
JUNE 1967
60°N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
±200
+200
+100
-100
+200
+200
+300
+100
+100
-100
0
228 251 279 130 136 122 243
111 125 158 190 179 194 163 145 174 181 371
153 169 182 197 210 207 205 213 184 177 195 159
113 129 128 160 244 237 157 147 139 117 125 270
145 103 55 45 148 166 159 171 164 116 138 213
116 143 165 186 185 209 183 158 118 98 78 76 209
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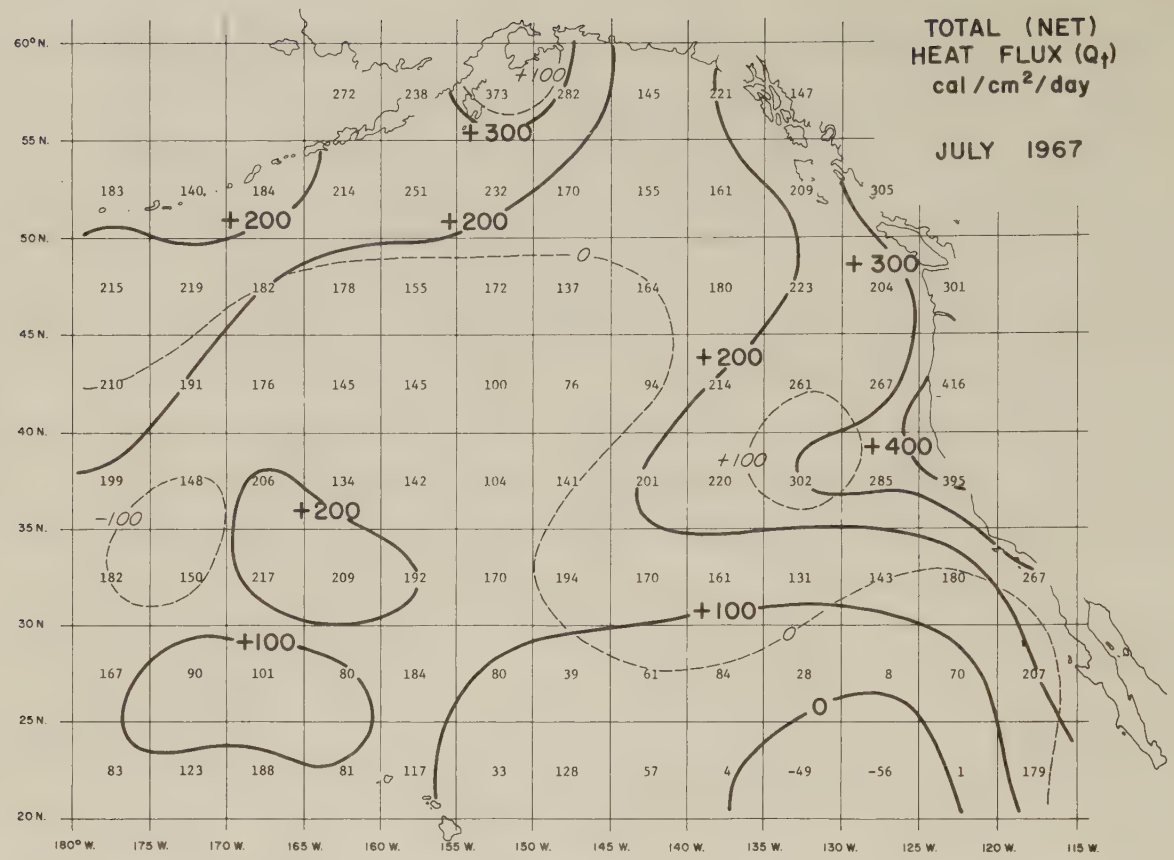
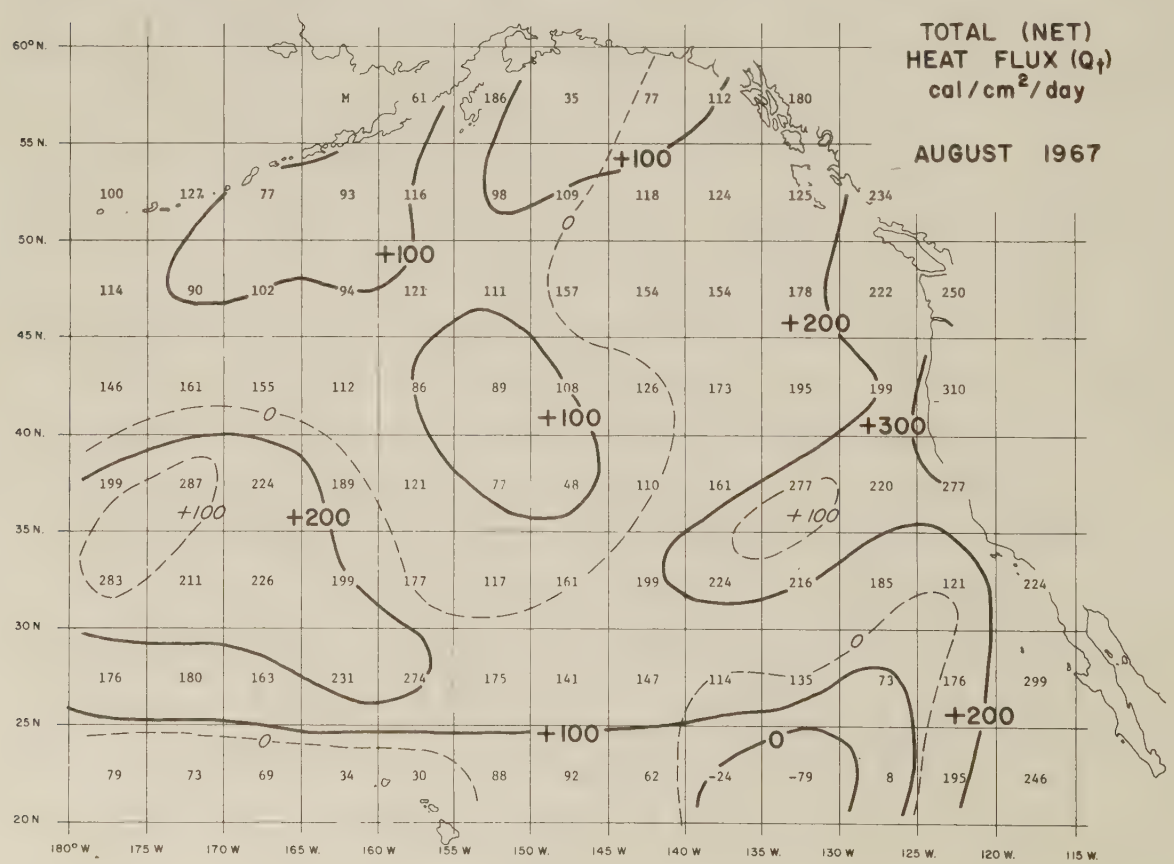

TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
JULY 1967
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+100
+300
+200
+200
+300
+200
+400
+100
-100
+200
+100
+100
0
0
272 238 373 282 145 221 147
183 140 184 214 251 232 170 155 161 209 305
215 219 182 178 155 172 137 164 180 223 204 301
210 191 176 145 145 100 76 94 214 261 267 416
199 148 206 134 142 104 141 201 220 302 285 395
182 150 217 209 192 170 194 170 161 131 143 180 267
167 90 101 80 184 80 39 61 84 28 8 70 207
83 123 188 81 117 33 128 57 4 -49 -56 1 179


TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
AUGUST 1967
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N
25 N
20 N
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+100
+100
+100
+200
+100
+300
+100
+200
+100
+100
0
0
0
0
M 61 186 35 77 112 180
100 122 77 93 116 98 109 118 124 125 234
114 90 102 94 121 111 157 154 154 178 222 250
146 161 155 112 86 89 108 126 173 195 199 310
199 287 224 189 121 77 48 110 161 277 220 277
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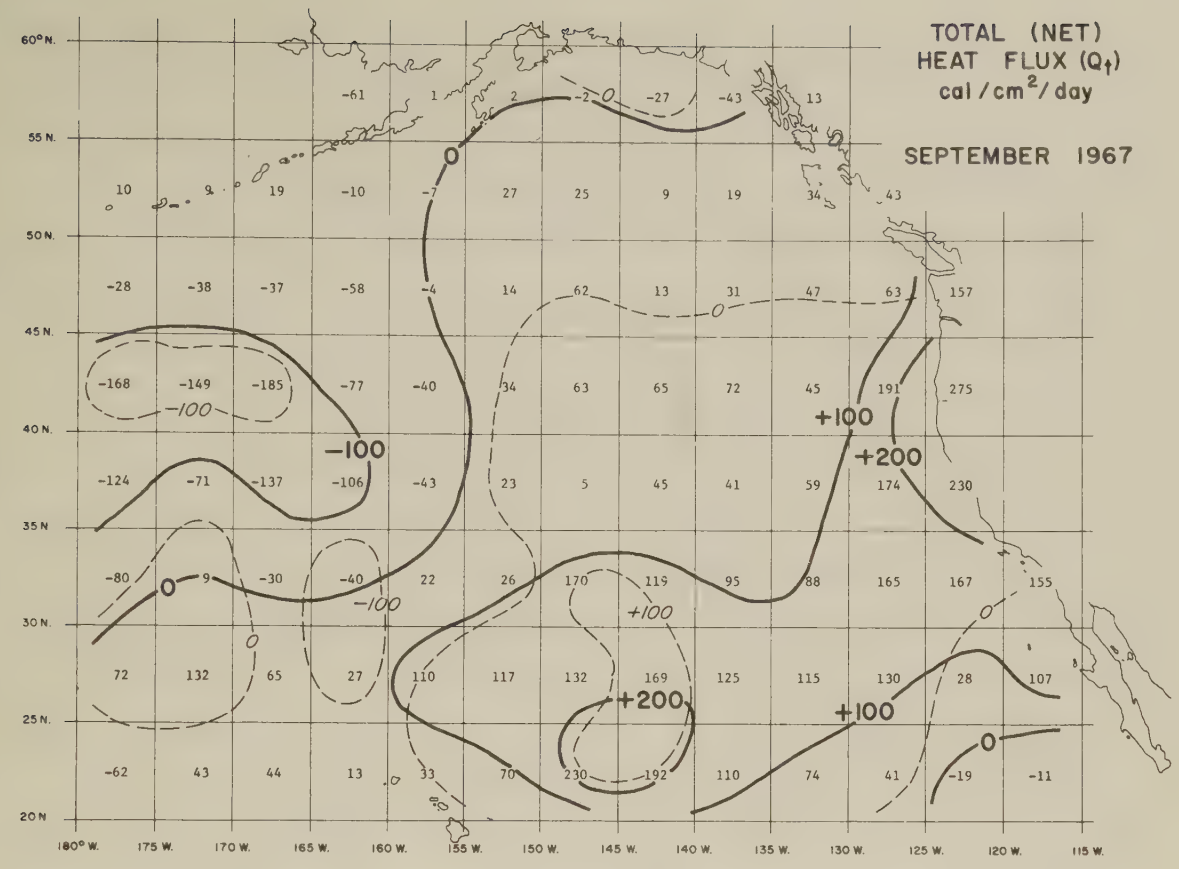
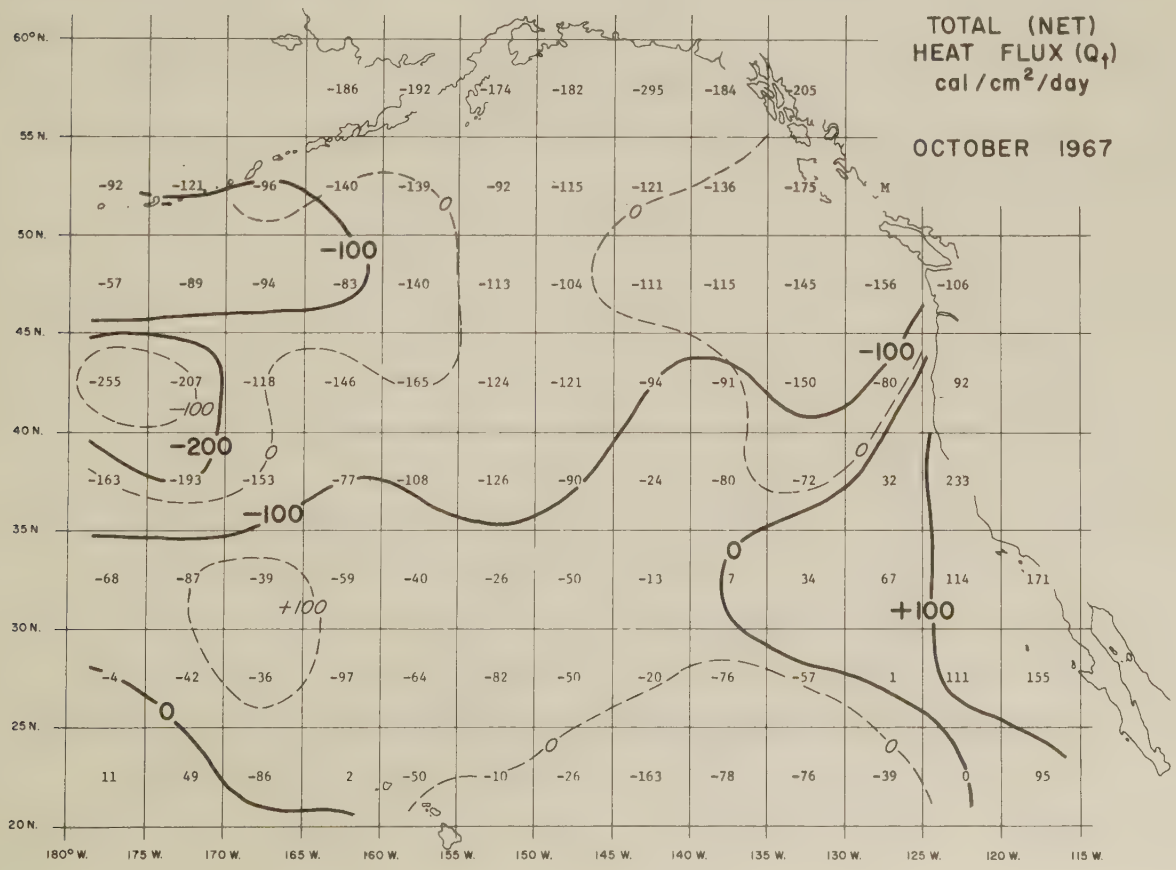
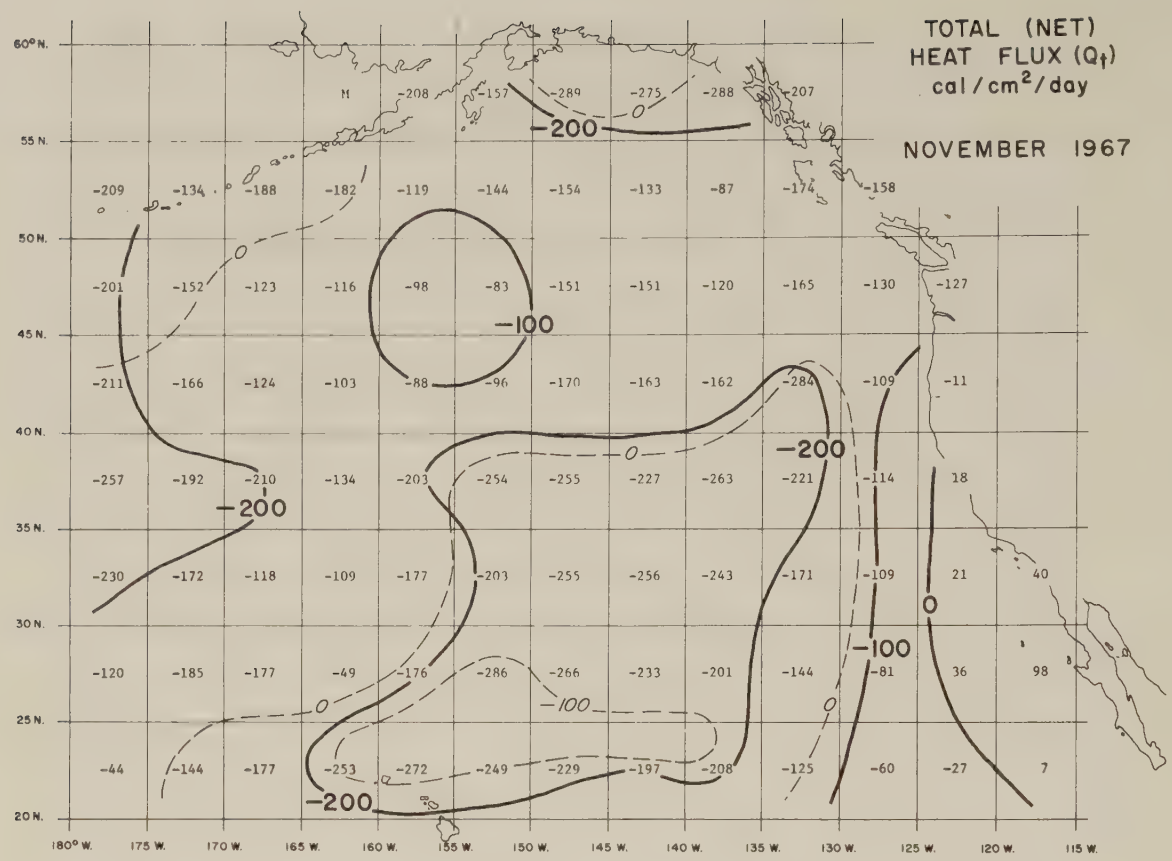

TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
SEPTEMBER 1967
60° N.
55 N.
50 N.
45 N.
40 N.
35 N
30 N.
25 N.
20 N
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
-100
+100
+200
+100
+200
+100
0


TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
OCTOBER 1967
60° N.
55 N.
50 N.
45 N.
40 N.
35 N
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
-100
-200
-100
-100
+100
+100
0


TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
NOVEMBER 1967
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
M -208 -157 -289 -275 -288 207
-209 -134 -188 -182 -119 -144 -154 -133 -87 -174 -158
-201 -152 -123 -116 -98 -83 -151 -151 -120 -165 -130 -127
-211 -166 -124 -103 -88 -96 -170 -163 -162 -284 -109 -11
-257 -192 -210 -134 -203 -254 -255 -227 -263 -221 -114 18
-230 -172 -118 -109 -177 -203 -255 -256 -243 -171 -109 21 40
-120 -185 -177 -49 -176 -286 -266 -233 -201 -144 -81 36 98
-44 -144 -177 -253 -272 -249 -229 -197 -208 -125 -60 -27 7
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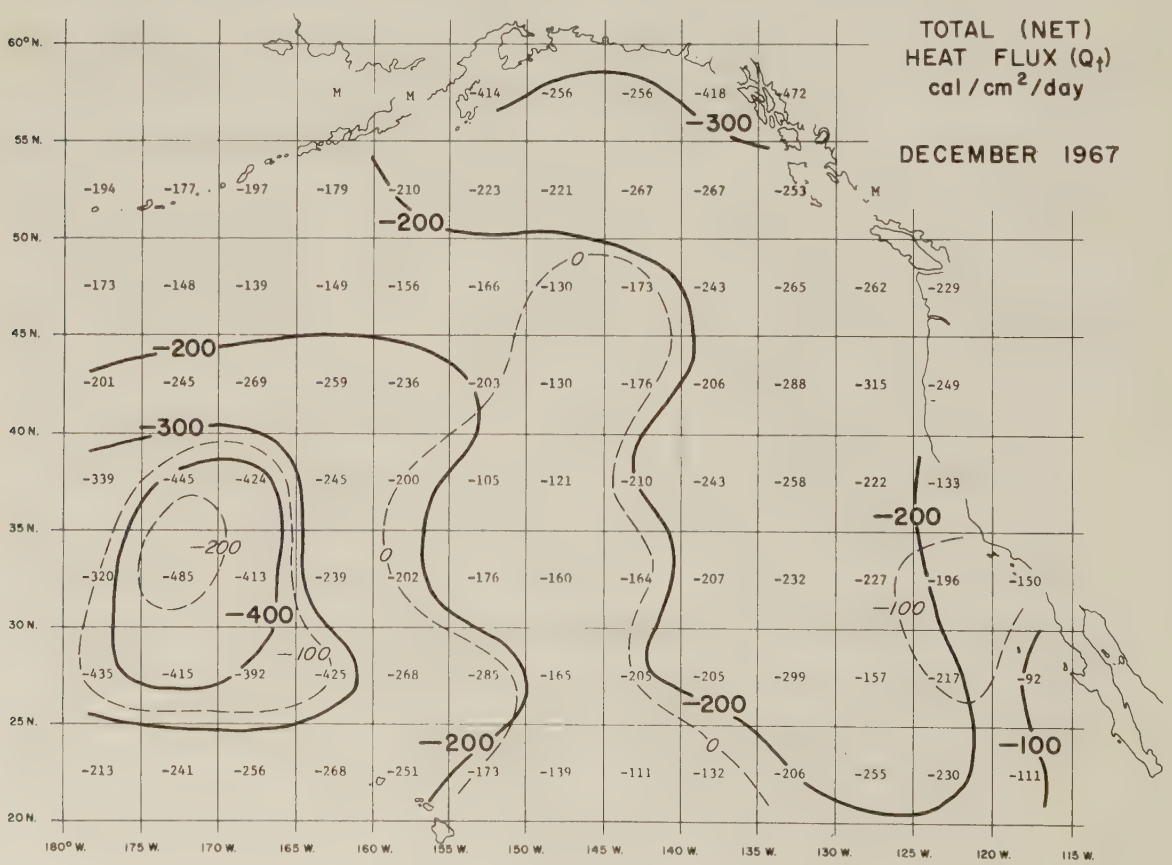
-400


TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
DECEMBER 1967
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50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
M M -414 -256 -256 -418 -472
-194 -177 -197 -179 -210 -223 -221 -267 -267 -253 M
-173 -148 -139 -149 -156 -166 -130 -173 -243 -265 -262 -229
-201 -245 -269 -259 -236 -203 -130 -176 -206 -288 -315 -249
-339 -445 -424 -245 -200 -105 -121 -210 -243 -258 -222 -133
-320 -485 -413 -239 -202 -176 -160 -164 -207 -232 -227 -196 -150
-435 -415 -392 -425 -268 -285 -165 -205 -205 -299 -157 -217 -92
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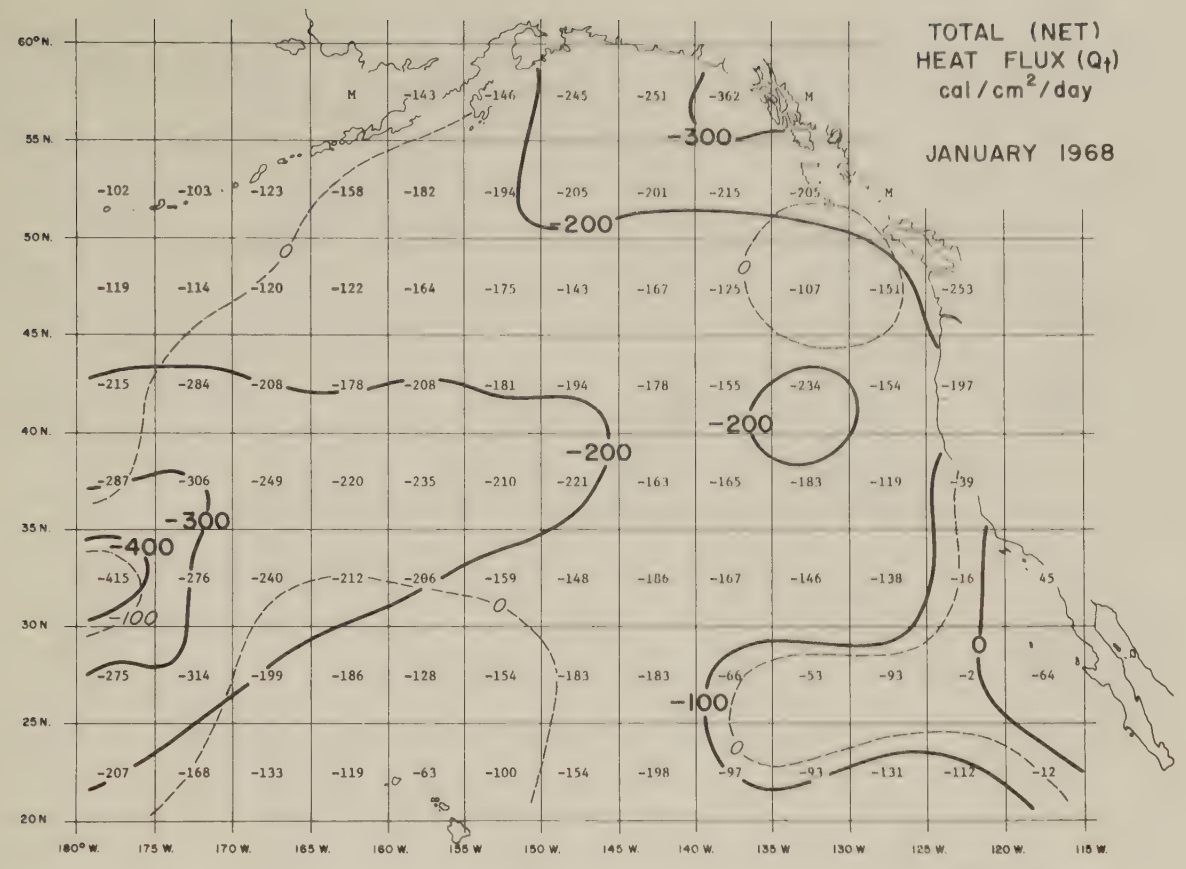
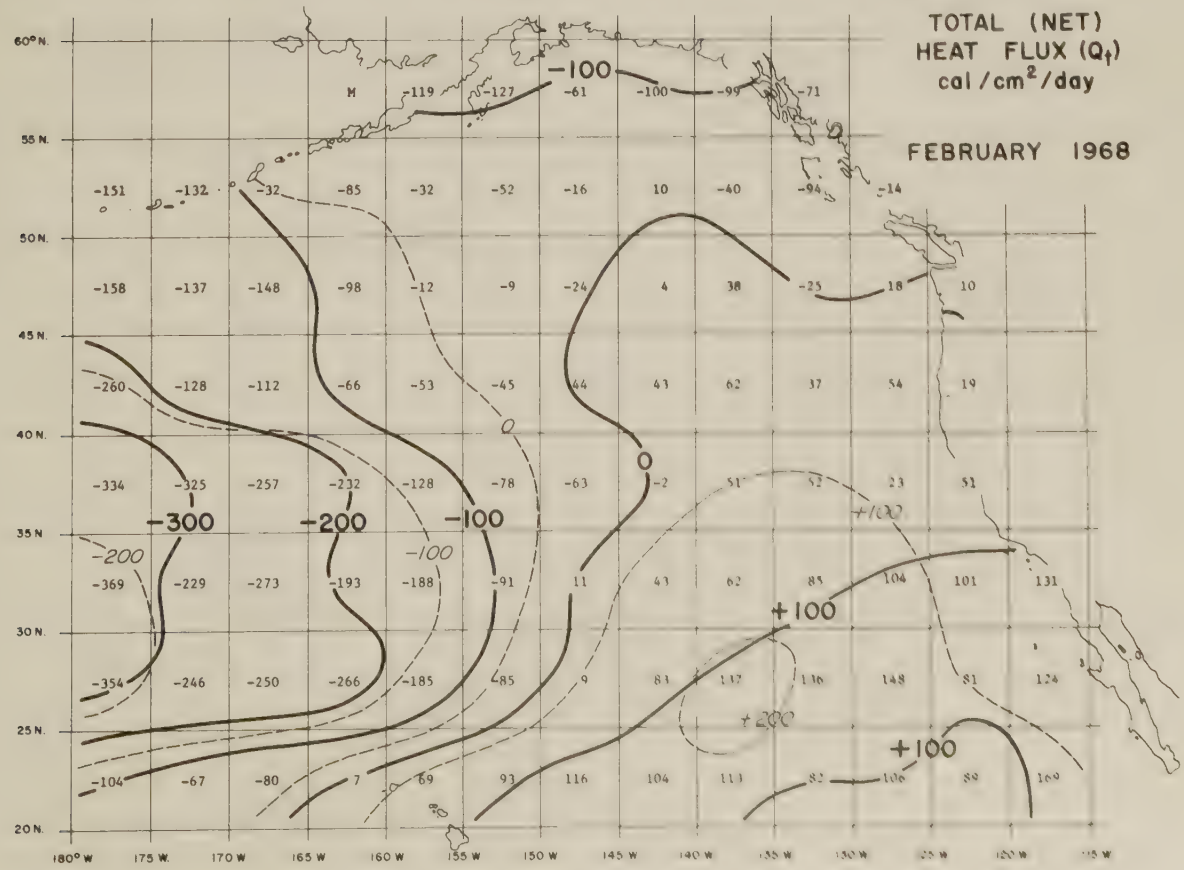
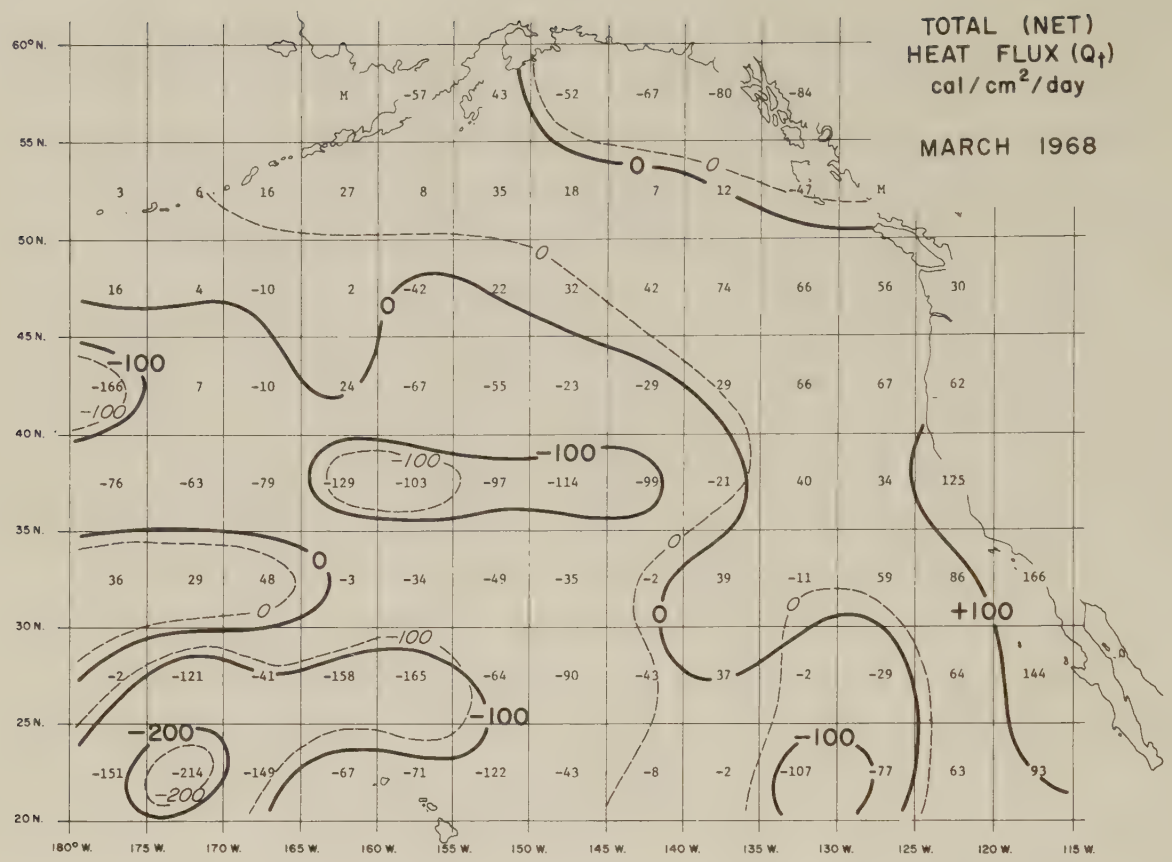

TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
JANUARY 1968
60°N.
55 N.
50N.
45 N.
40 N.
35 N.
30 N
25 N.
20 N
180° W.
175 W.
170 W.
165 W.
160 W.
155 W
150 W.
145 W.
140 W.
135 W
130 W
125 W.
120 W.
115 W.
-300
-200
-400
-100
0


TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
FEBRUARY 1968
60°N.
55 N.
50N.
45 N.
40 N.
35 N
30 N.
25 N.
20 N.
180° W
175 W.
170 W
165 W
160 W
155 W
150 W
145 W
140 W
-100
-300
-200
0
+100
+200


TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
MARCH 1968
60°N.
55 N.
50N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
M
-57 43 -52 -67 -80 -84
3 6 16 27 8 35 18 7 12 -47 M
16 4 -10 2 -42 22 32 42 74 66 56 30
-166 7 -10 24 -67 -55 -23 -29 29 66 67 62
-76 -63 -79 -129 -103 -97 -114 -99 -21 40 34 125
36 29 48 -3 -34 -49 -35 -2 39 -11 59 86 166
-2 -121 -41 -158 -165 -64 -90 -43 37 -2 -29 64 144
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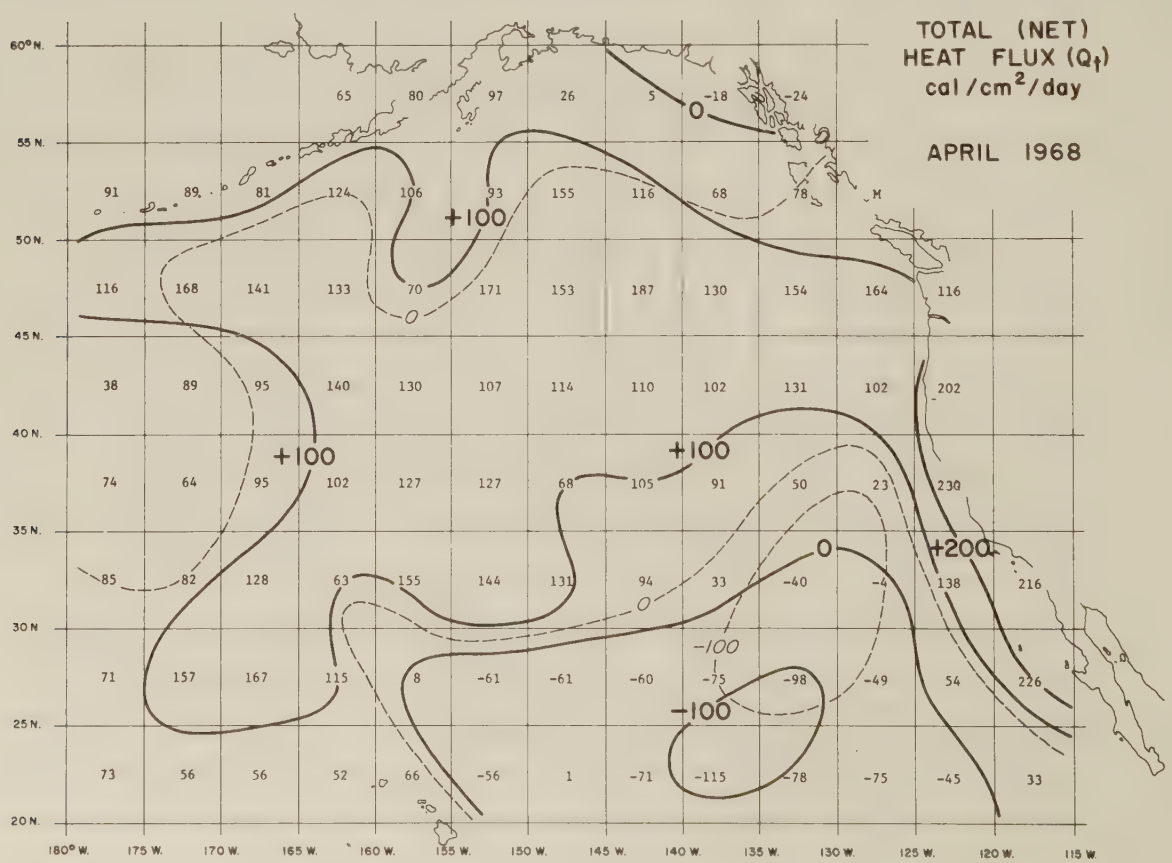
-200
+100


TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
APRIL 1968
60°N.
55 N.
50N.
45 N.
40 N.
35 N.
30 N
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
65 80 97 26 5 -18 -24
91 89 81 124 106 93 155 116 68 78 M
116 168 141 133 70 171 153 187 130 154 164 116
38 89 95 140 130 107 114 110 102 131 102 202
74 64 95 102 127 127 68 105 91 50 23 230
85 82 128 63 155 144 131 94 33 -40 -4 138 216
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73 56 56 52 66 -56 1 -71 -115 -78 -75 -45 33
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+100
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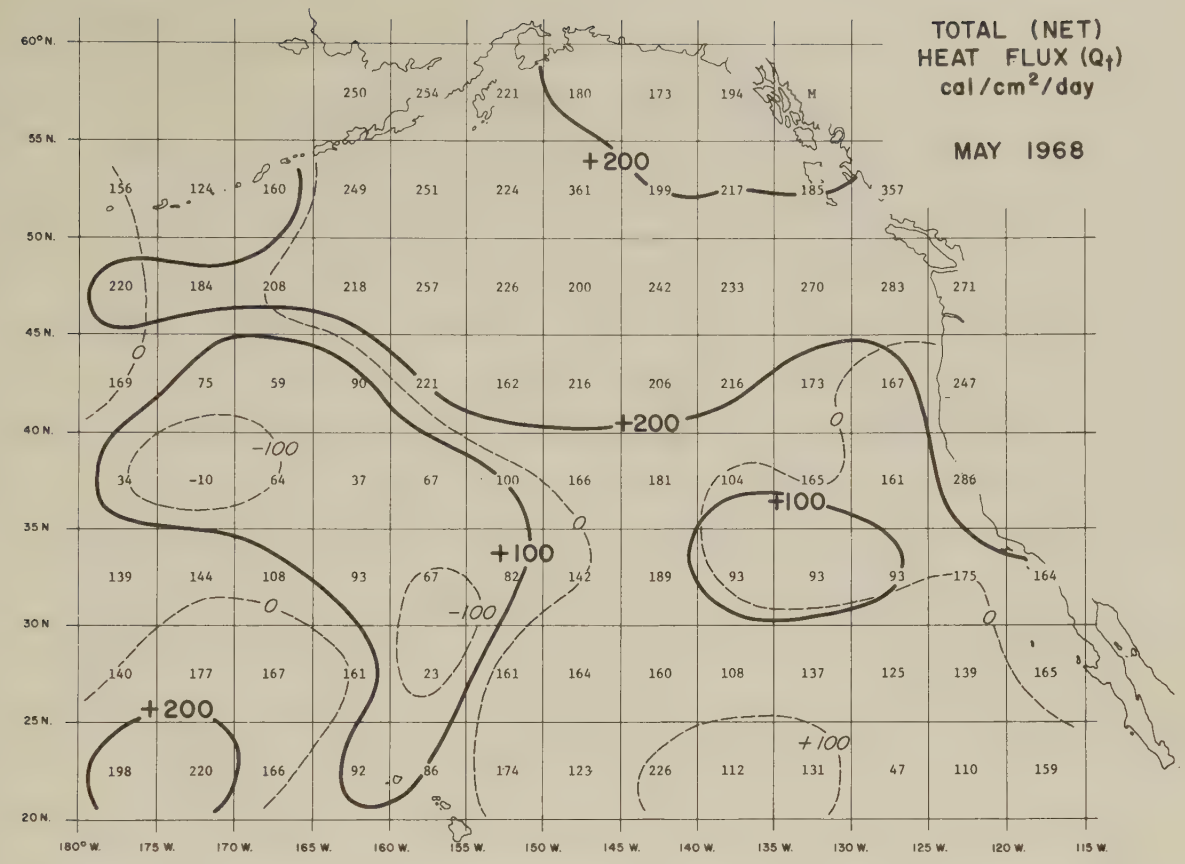
-100


TOTAL (NET)
HEAT FLUX (Q_t)
cal/cm²/day
MAY 1968
60°N.
55 N.
50 N.
45 N.
40 N.
35 N
30 N
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+200
+100
-100
0
250 254 221 180 173 194 M
156 124 160 249 251 224 361 199 217 185 357
220 184 208 218 257 226 200 242 233 270 283 271
169 75 59 90 221 162 216 206 216 173 167 247
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139 144 108 93 67 82 142 189 93 93 93 175 164
140 177 167 161 23 161 164 160 108 137 125 139 165
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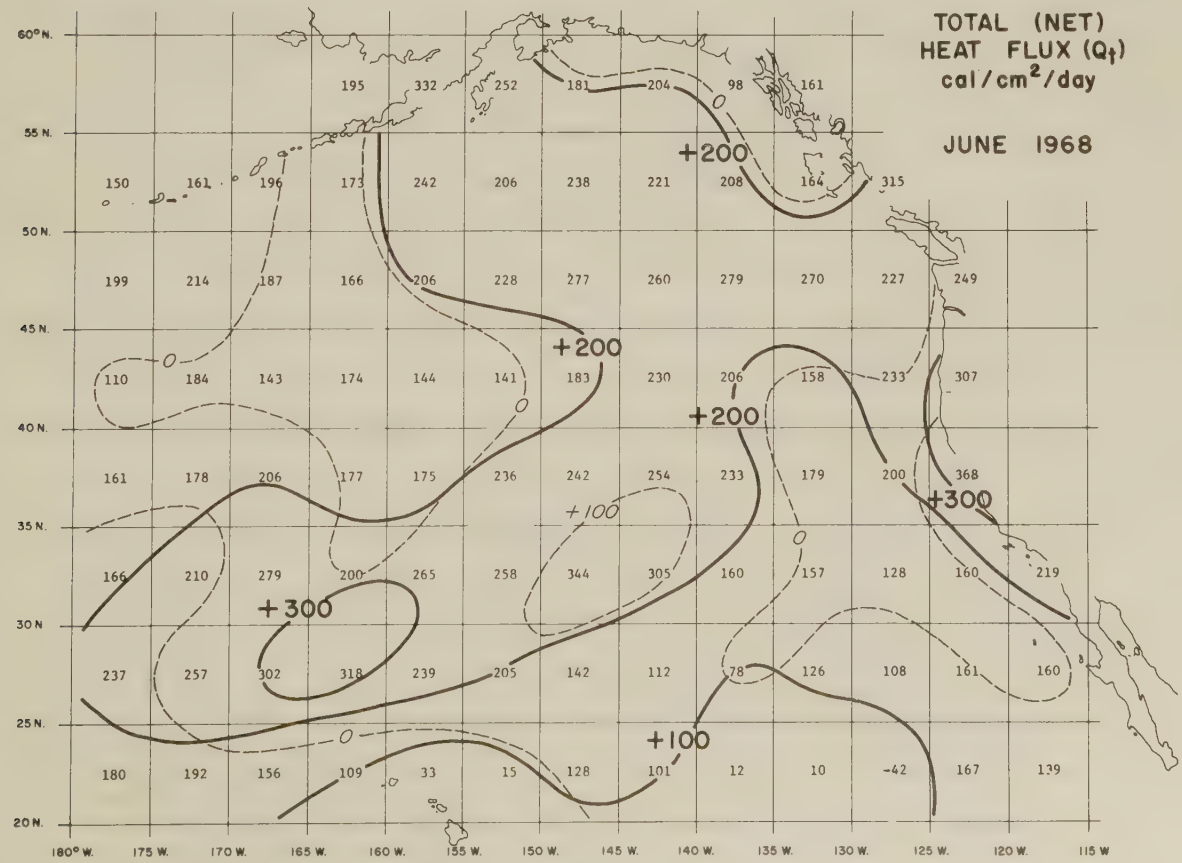
TOTAL (NET)
HEAT FLUX (Q_t)
cal/cm²/day
JUNE 1968
60°N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W
+200
+300
+100
0
195 332 252 181 204 98 161
150 161 196 173 242 206 238 221 208 164 315
199 214 187 166 206 228 277 260 279 270 227 249
110 184 143 174 144 141 183 230 206 158 233 307
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237 257 302 318 239 205 142 112 78 126 108 161 160
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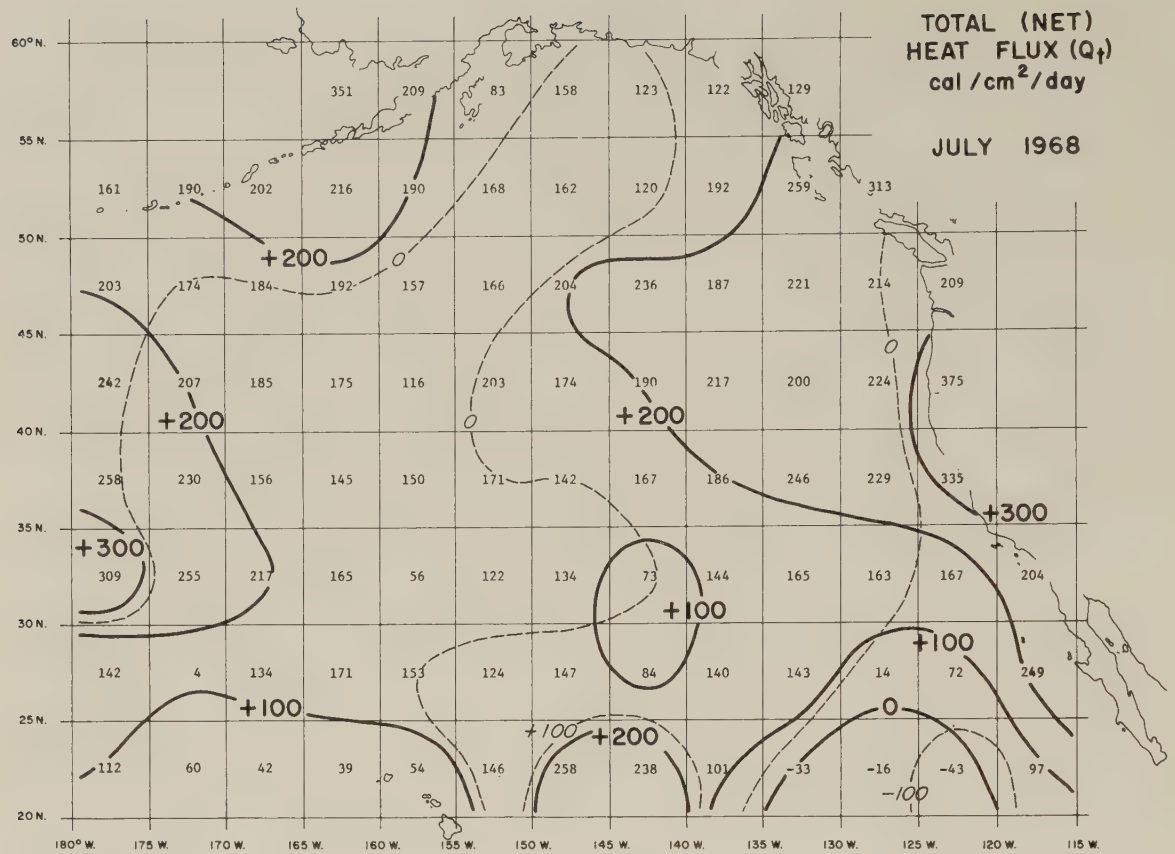
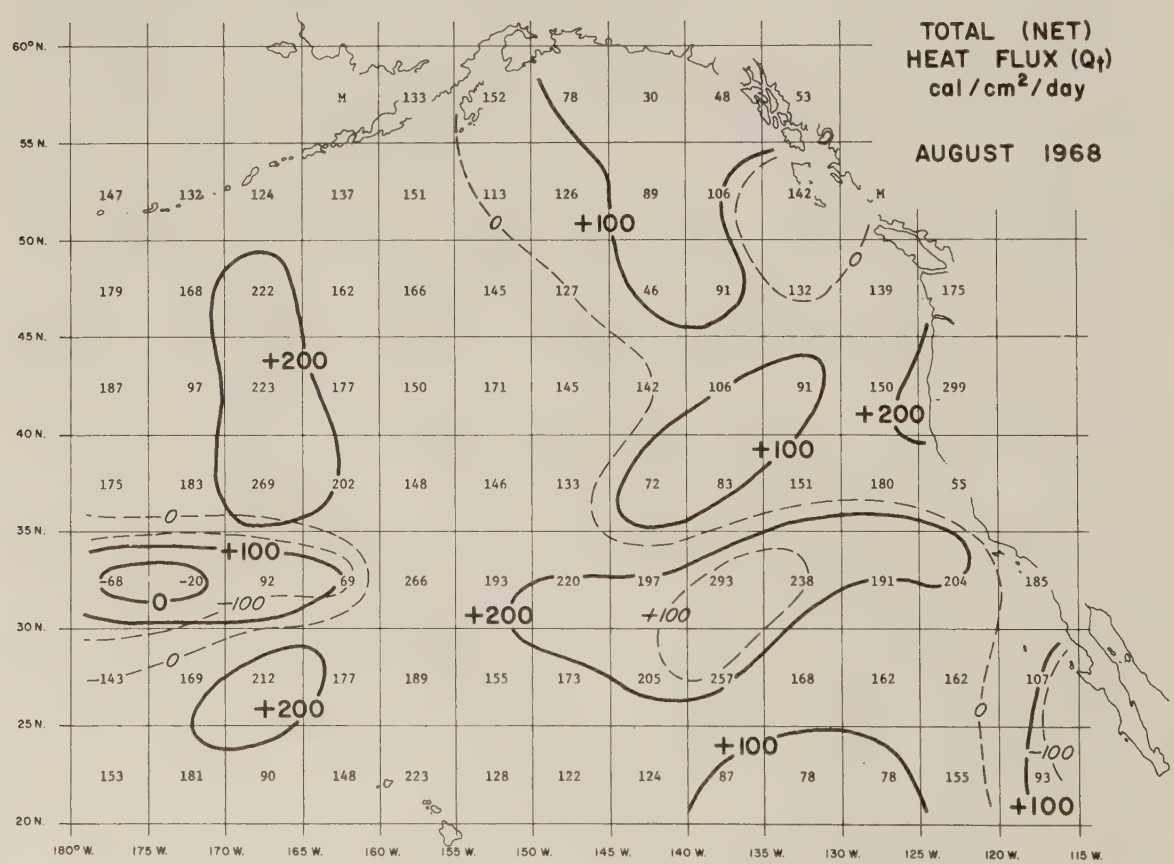
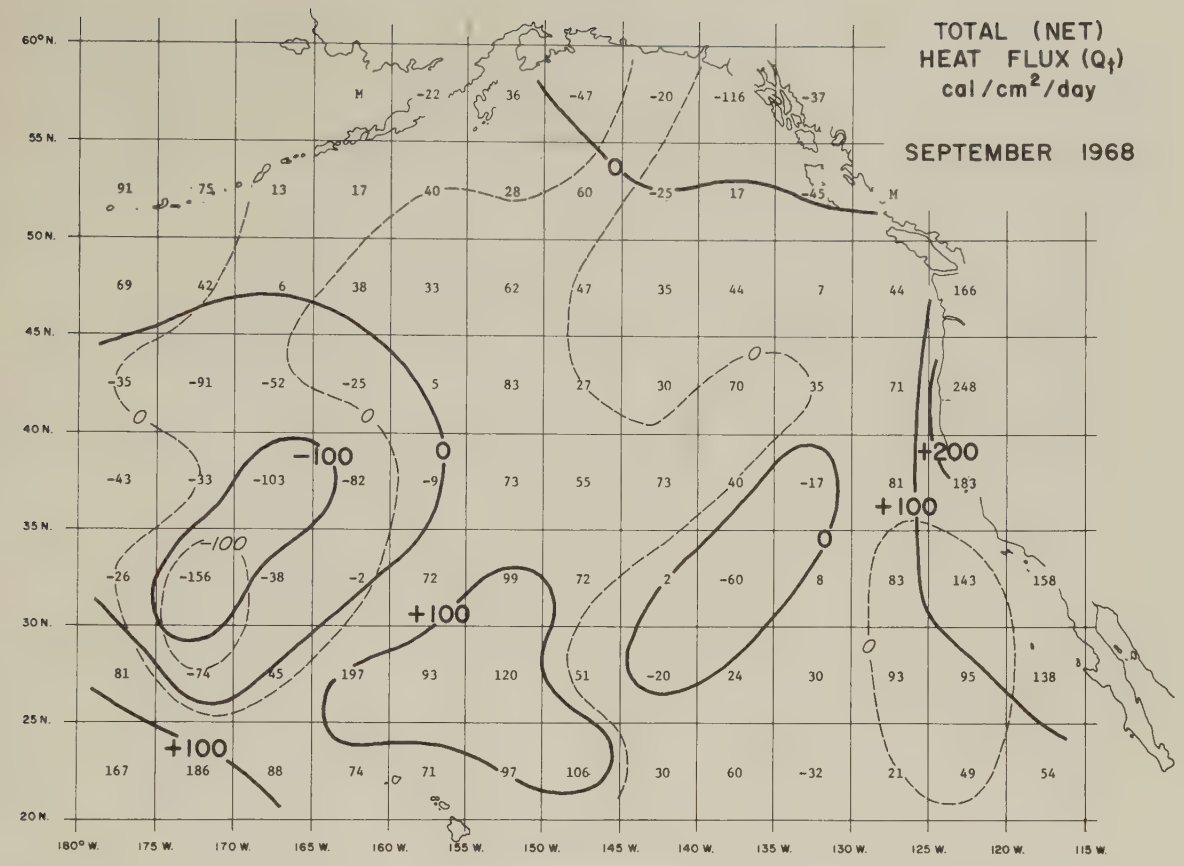

TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm² / day
JULY 1968
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+200
+300
+100
0
-100


TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm² / day
AUGUST 1968
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+200
+100
0
-100


TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
SEPTEMBER 1968
60° N.
55 N.
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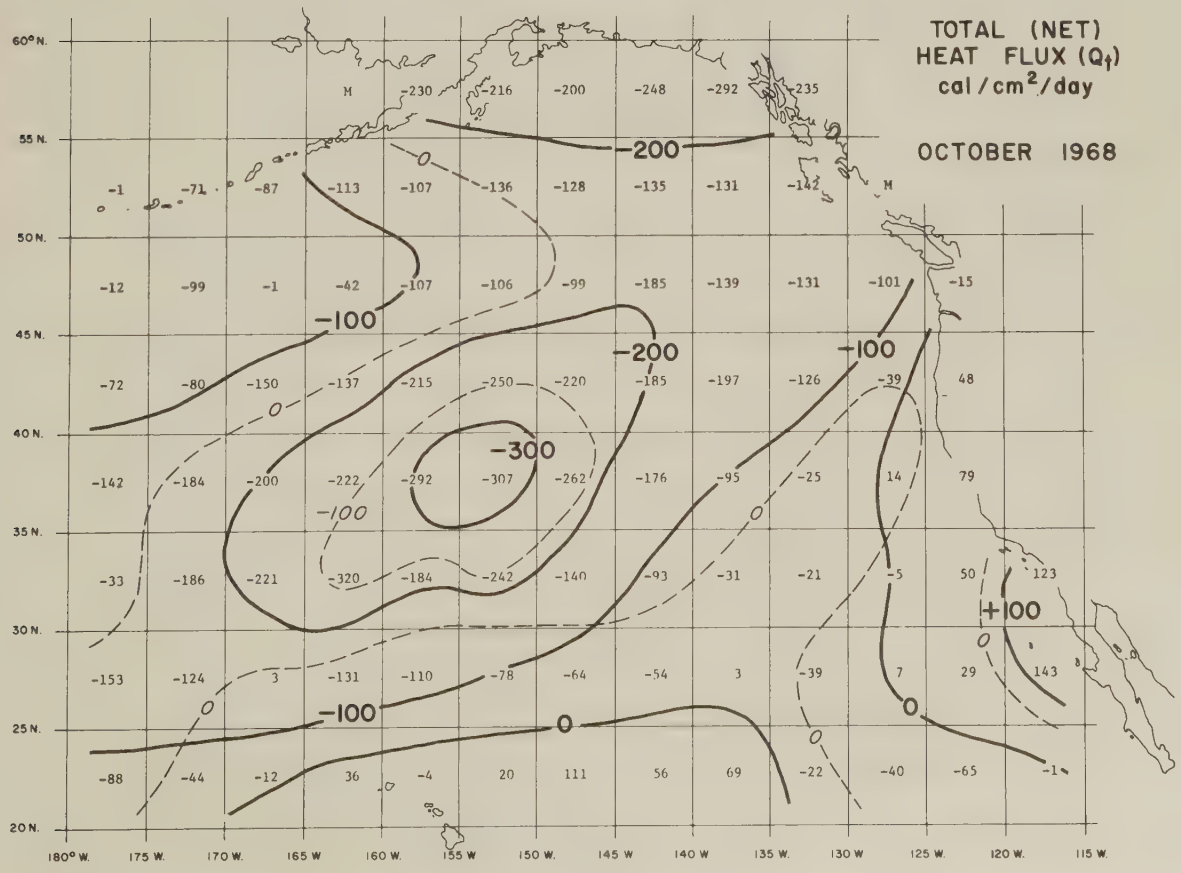
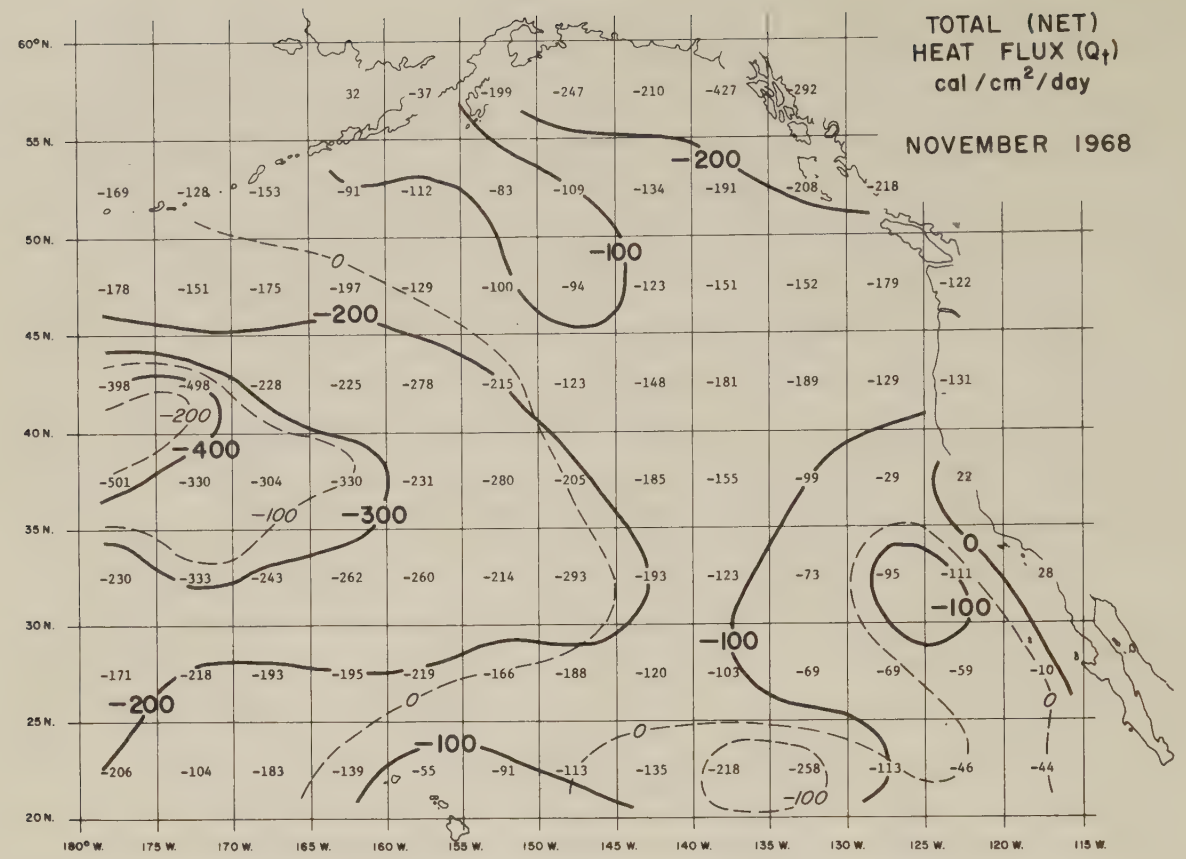
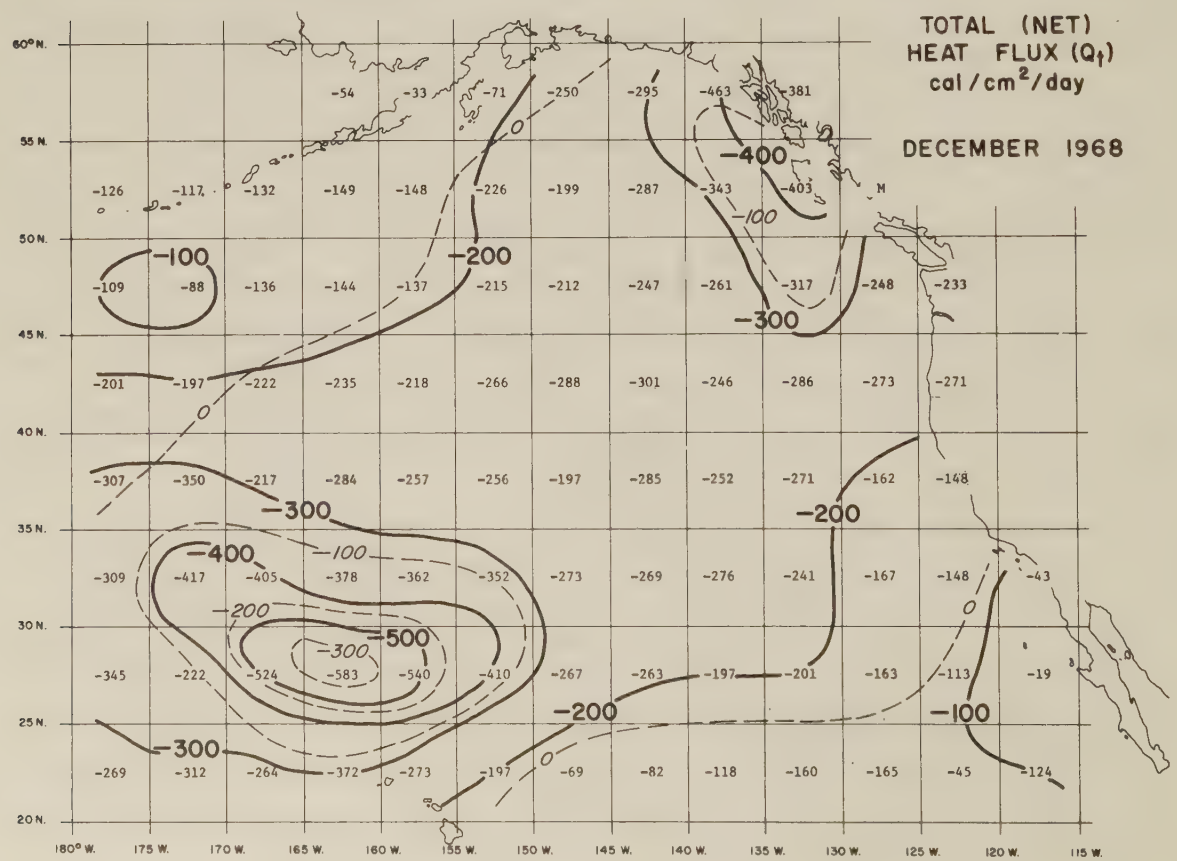
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
-100
0
+100
+200


TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
OCTOBER 1968
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
-100
-200
-300
0
+100


TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
NOVEMBER 1968
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.


TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
DECEMBER 1968
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
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155 W.
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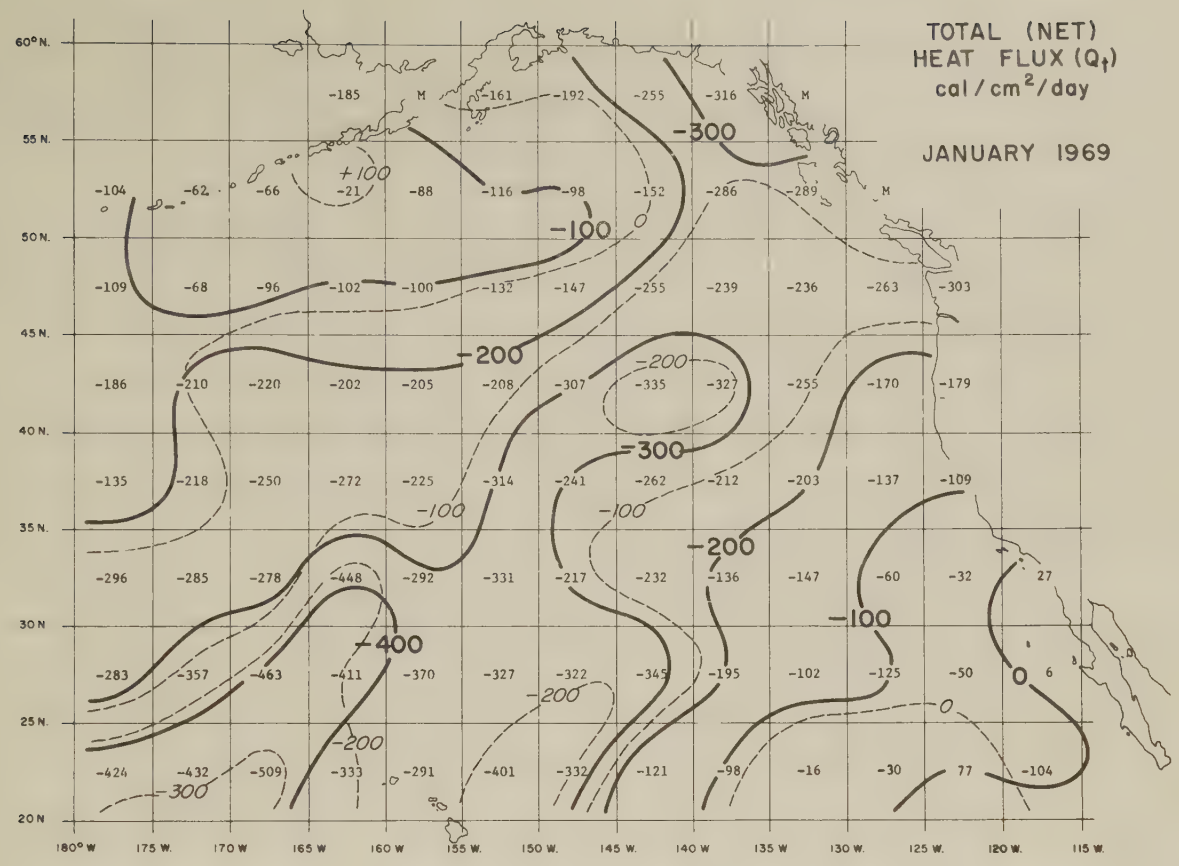
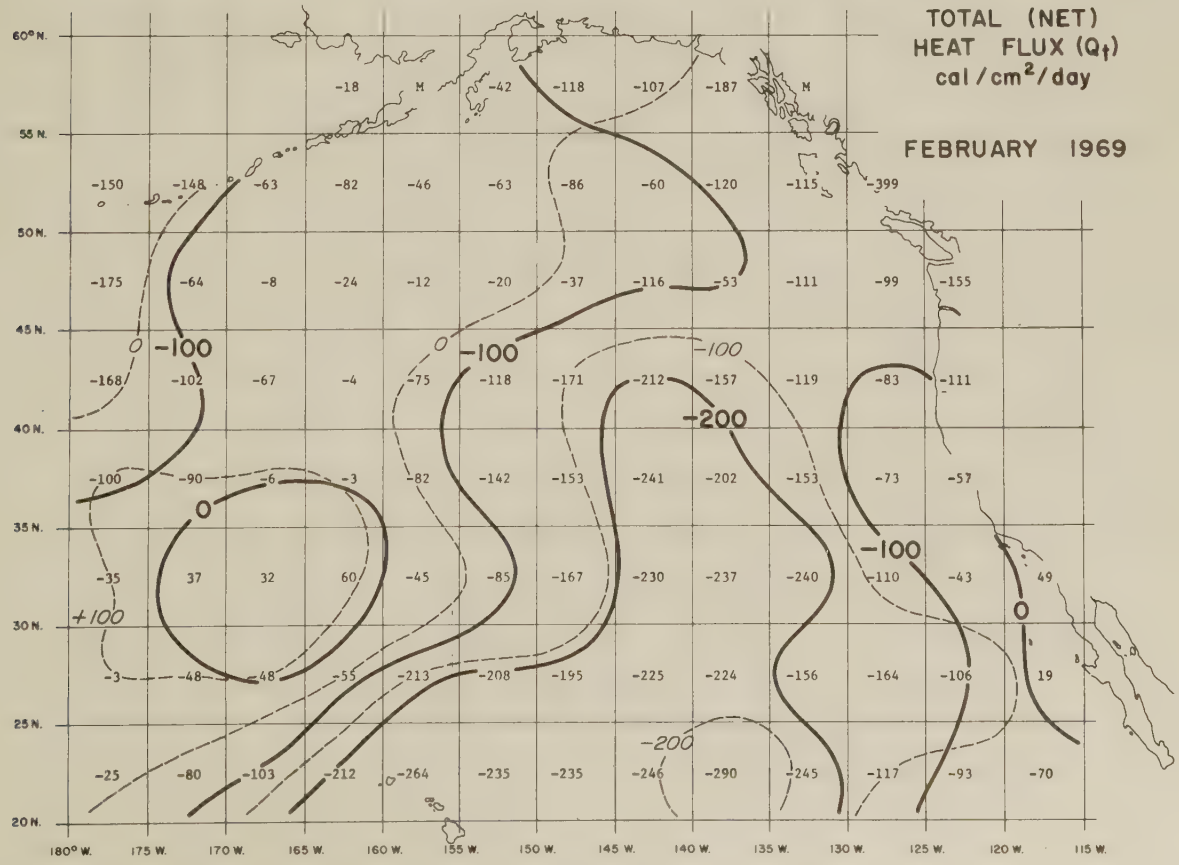

TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
JANUARY 1969
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N
25 N.
20 N
180° W
175 W.
170 W
165 W
160 W
155 W.
150 W.
145 W.
140 W
135 W
130 W.
125 W.
120 W.
115 W.


TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
FEBRUARY 1969
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
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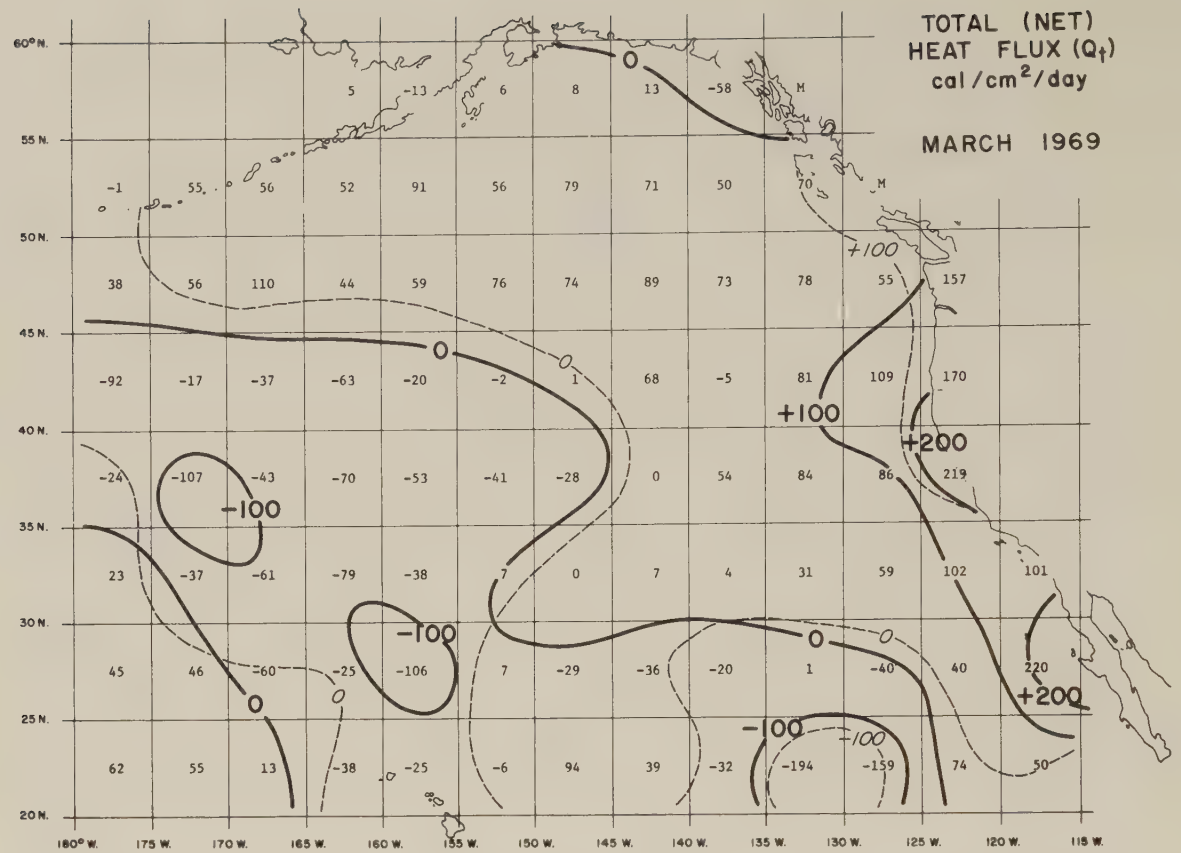
135 W.
130 W.
125 W.
120 W.
115 W.


TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
MARCH 1969
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50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
0
+100
+200
-100
5 -13 6 8 13 -58 M
-1 55 56 52 91 56 79 71 50 70 M
38 56 110 44 59 76 74 89 73 78 55 157
-92 -17 -37 -63 -20 -2 1 68 -5 81 109 170
-24 -107 -43 -70 -53 -41 -28 0 54 84 86 219
23 -37 -61 -79 -38 7 0 7 4 31 59 102 101
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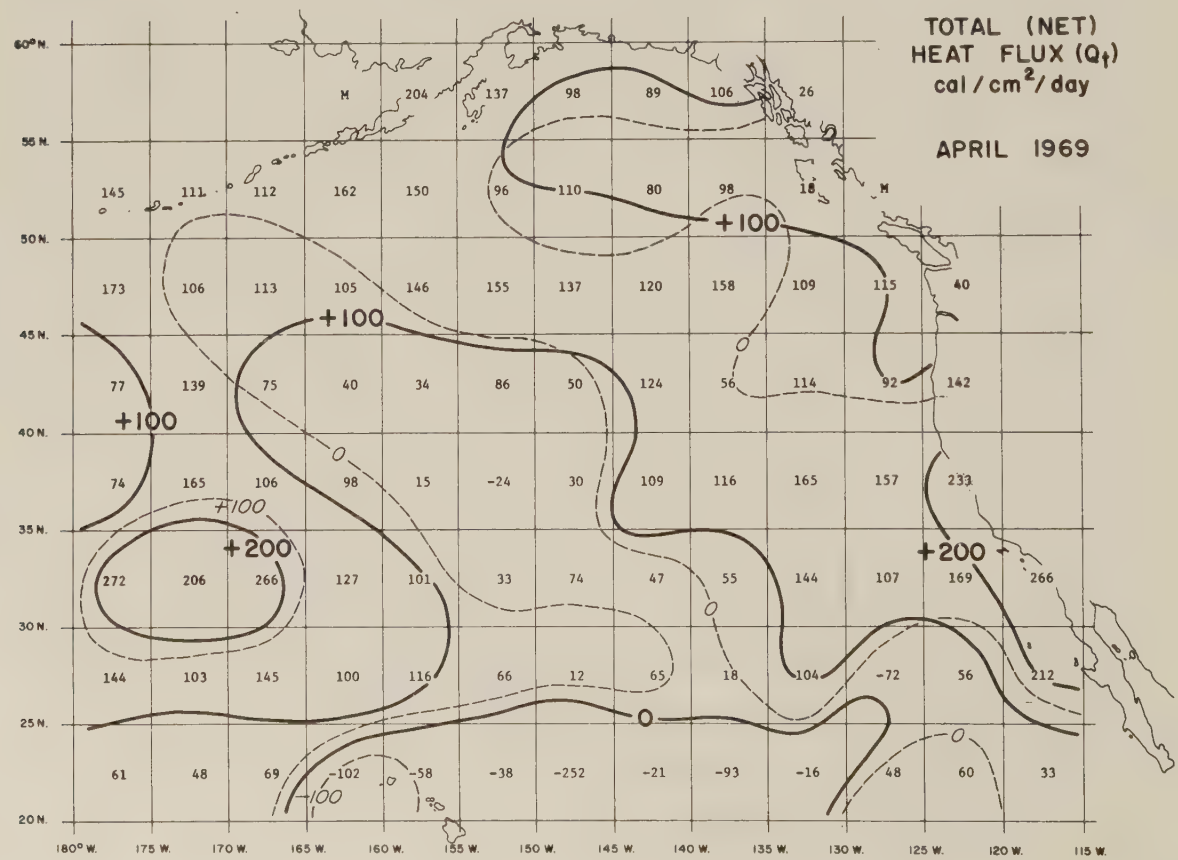
TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
APRIL 1969
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50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
0
+100
+200
-100
M 204 137 98 89 106 26
145 111 112 162 150 96 110 80 98 18 M
173 106 113 105 146 155 137 120 158 109 115 40
77 139 75 40 34 86 50 124 56 114 92 142
74 165 106 98 15 -24 30 109 116 165 157 233
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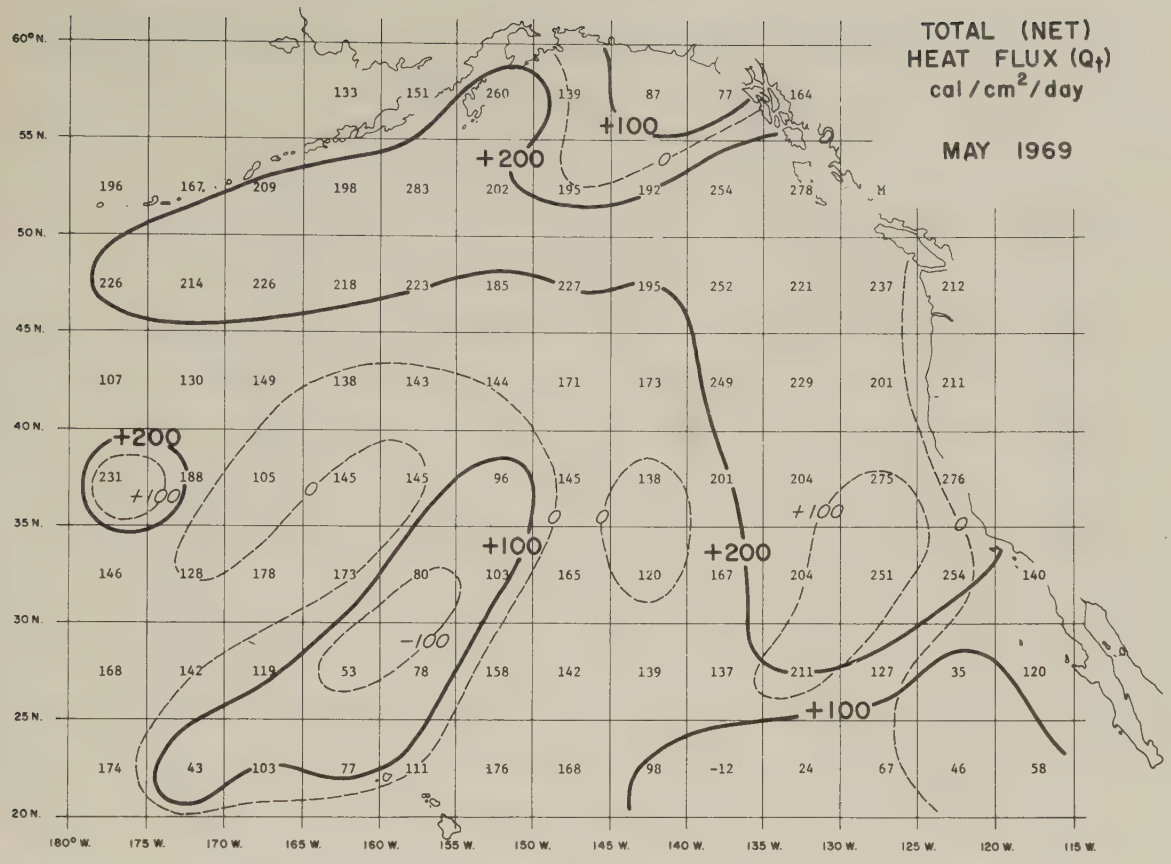
TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
MAY 1969
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
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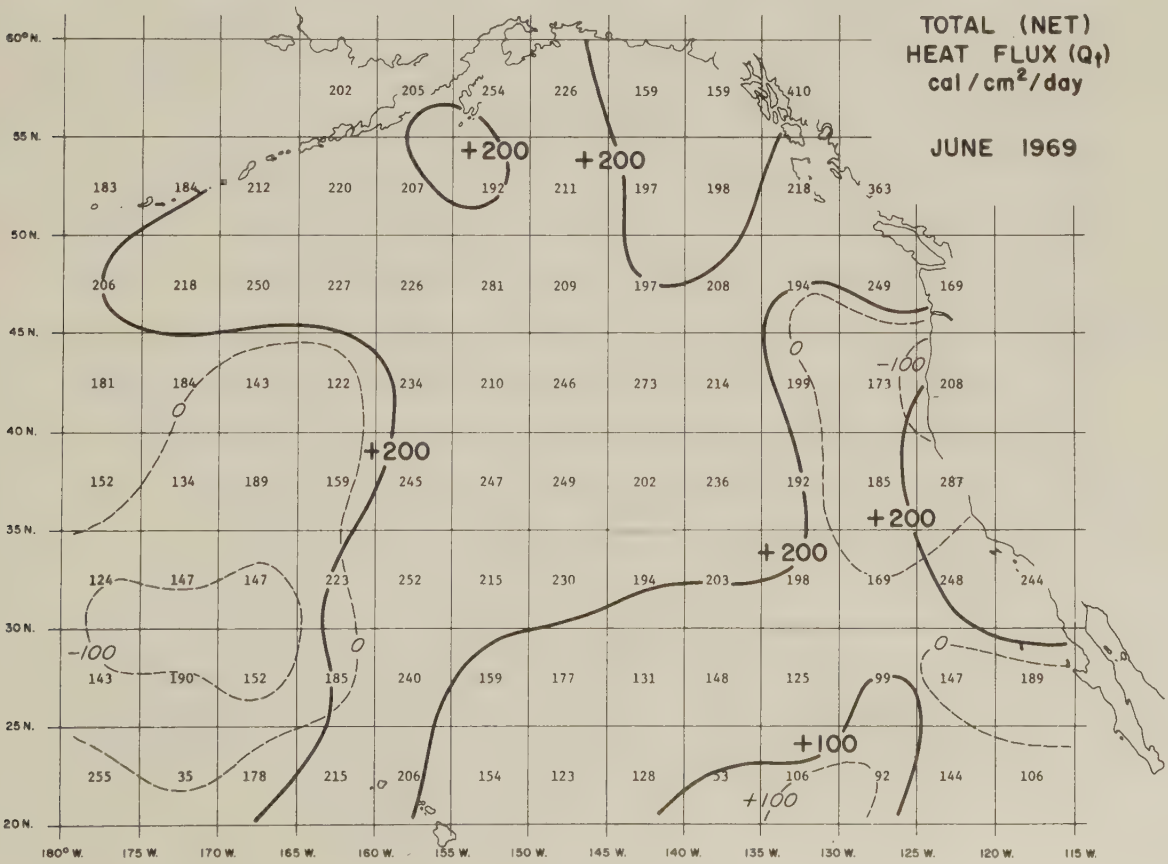
130 W.
125 W.
120 W.
115 W.
+200
+100
0
-100


TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
JUNE 1969
60° N.
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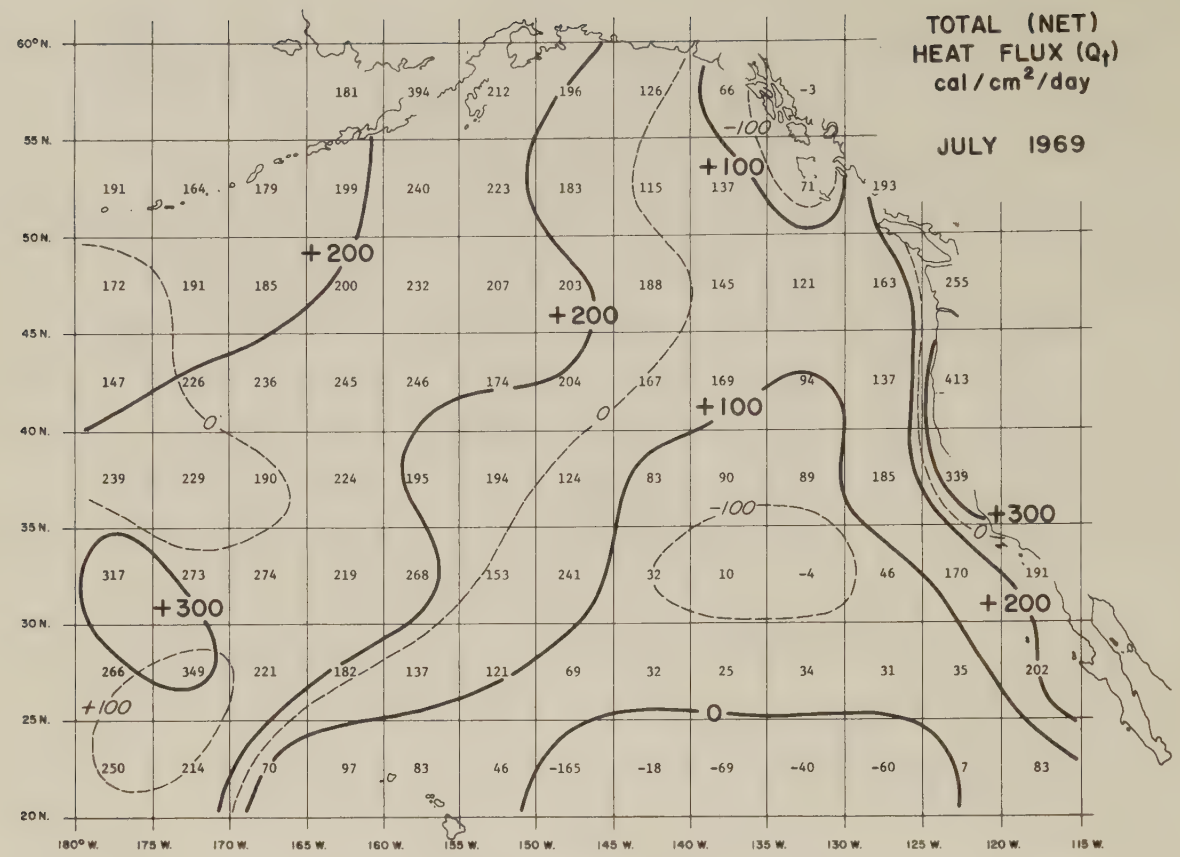
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+200
+100
0
-100


TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
JULY 1969
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+200
+200
+100
+100
-100
+300
+300
+200
+100
0
0
0
181 394 212 196 126 66 -3
191 164 179 199 240 223 183 115 137 71 193
172 191 185 200 232 207 203 188 145 121 163 255
147 226 236 245 246 174 204 167 169 94 137 413
239 229 190 224 195 194 124 83 90 89 185 339
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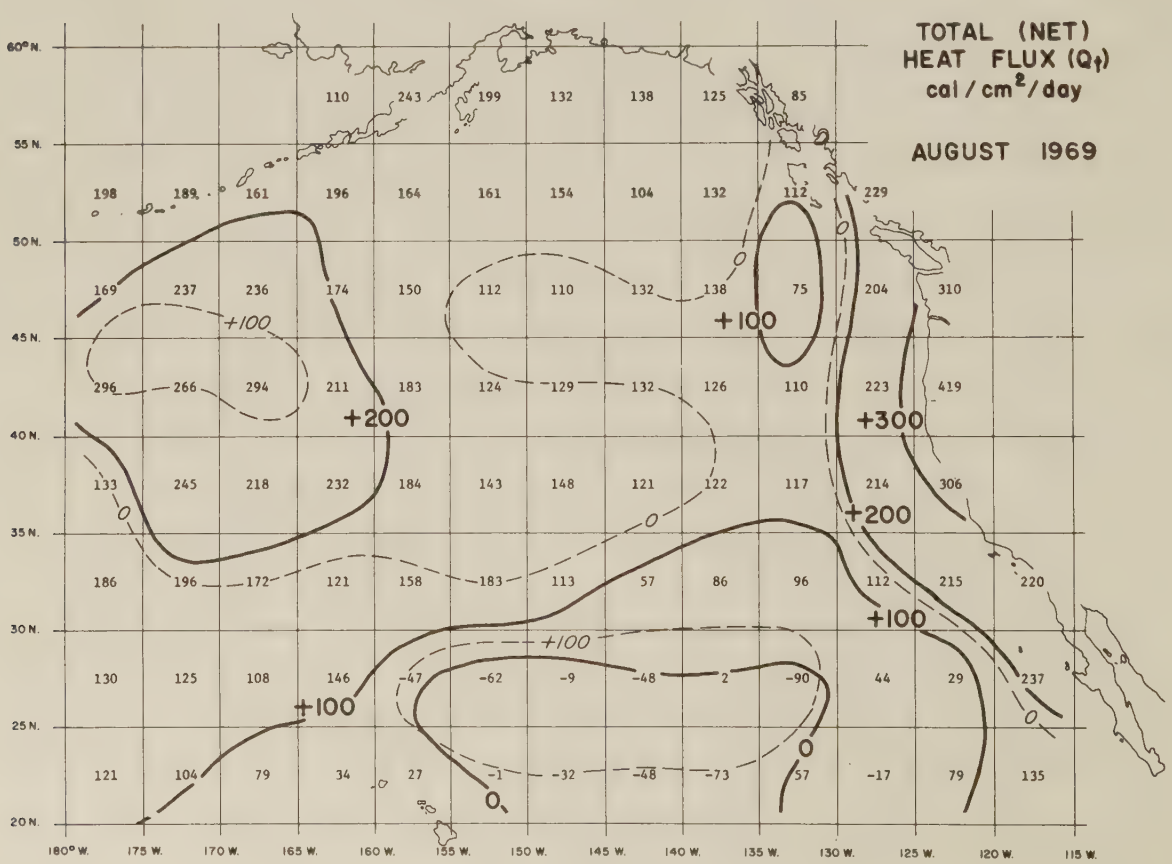
TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
AUGUST 1969
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+100
+200
+100
+300
+200
+100
+100
+100
0
0
0
0
110 243 199 132 138 125 85
198 189 161 196 164 161 154 104 132 112 229
169 237 236 174 150 112 110 132 138 75 204 310
296 266 294 211 183 124 129 132 126 110 223 419
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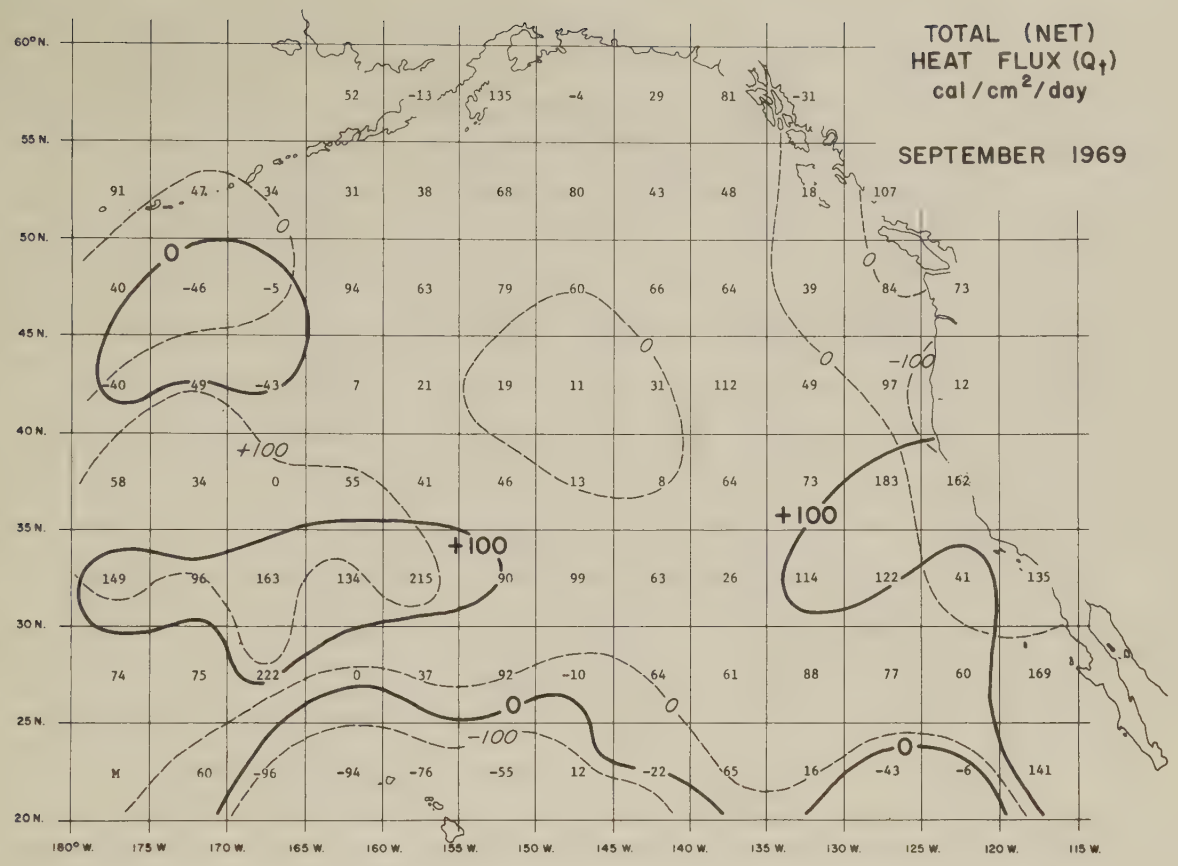
TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
SEPTEMBER 1969
60° N.
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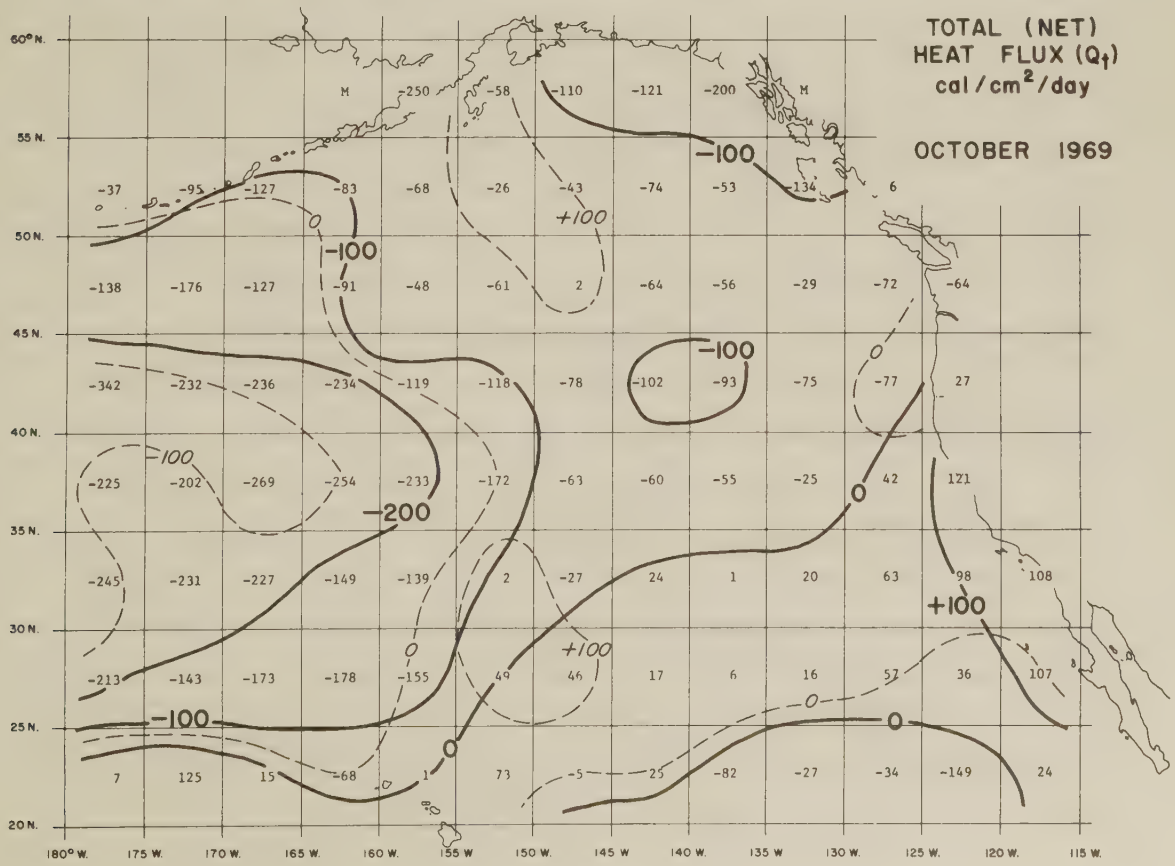
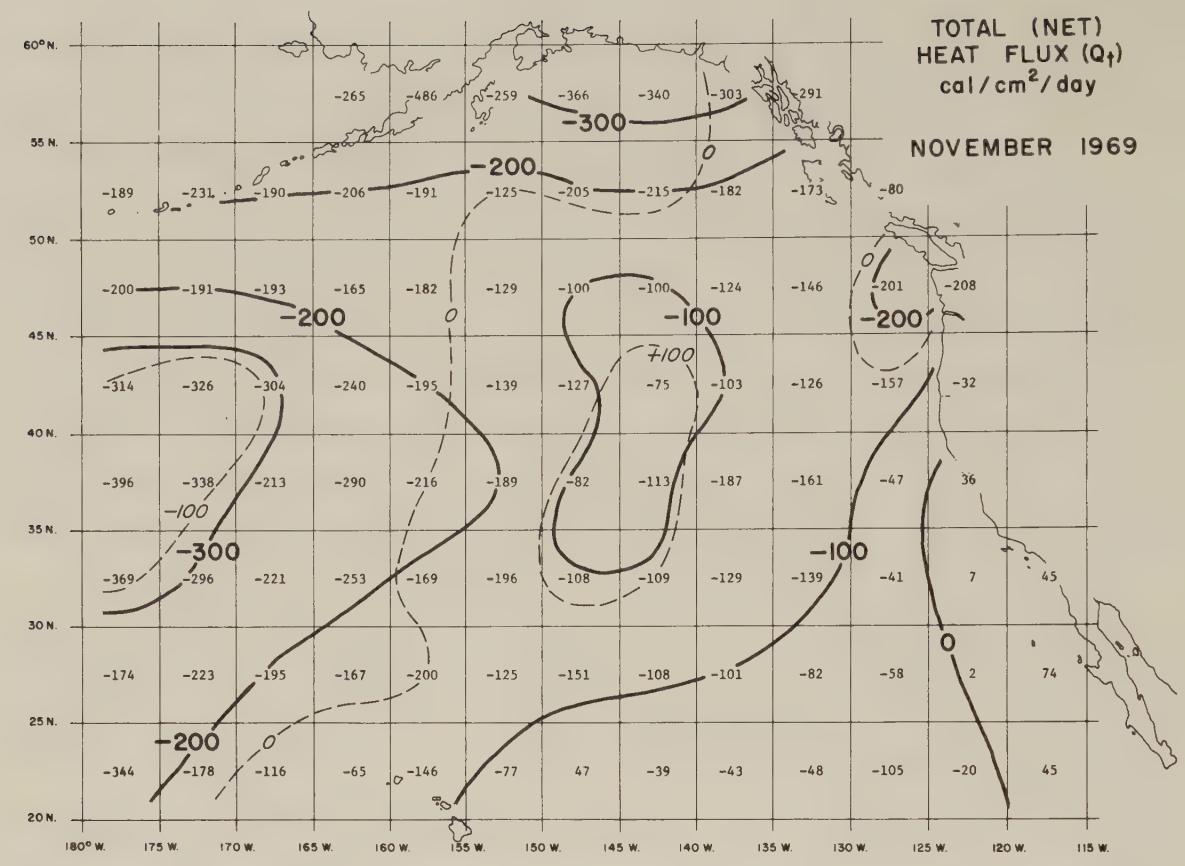
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
0
+100
-100


TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
OCTOBER 1969
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W
150 W.
145 W
140 W.
135 W
130 W.
125 W.
120 W.
115 W.
0
+100
-100
-200


TOTAL (NET)
HEAT FLUX (Q_t)
cal/cm²/day
NOVEMBER 1969
60°N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
-300
-200
-100
0
-265 -486 -259 -366 -340 -303 291
-189 -231 -190 -206 -191 -125 -205 -215 -182 -173 -80
-200 -191 -193 -165 -182 -129 -100 -100 -124 -146 -201 -208
-314 -326 -304 -240 -195 -139 -127 -75 -103 -126 -157 -32
-396 -338 -213 -290 -216 -189 -82 -113 -187 -161 -47 36
-369 -296 -221 -253 -169 -196 -108 -109 -129 -139 -41 7 45
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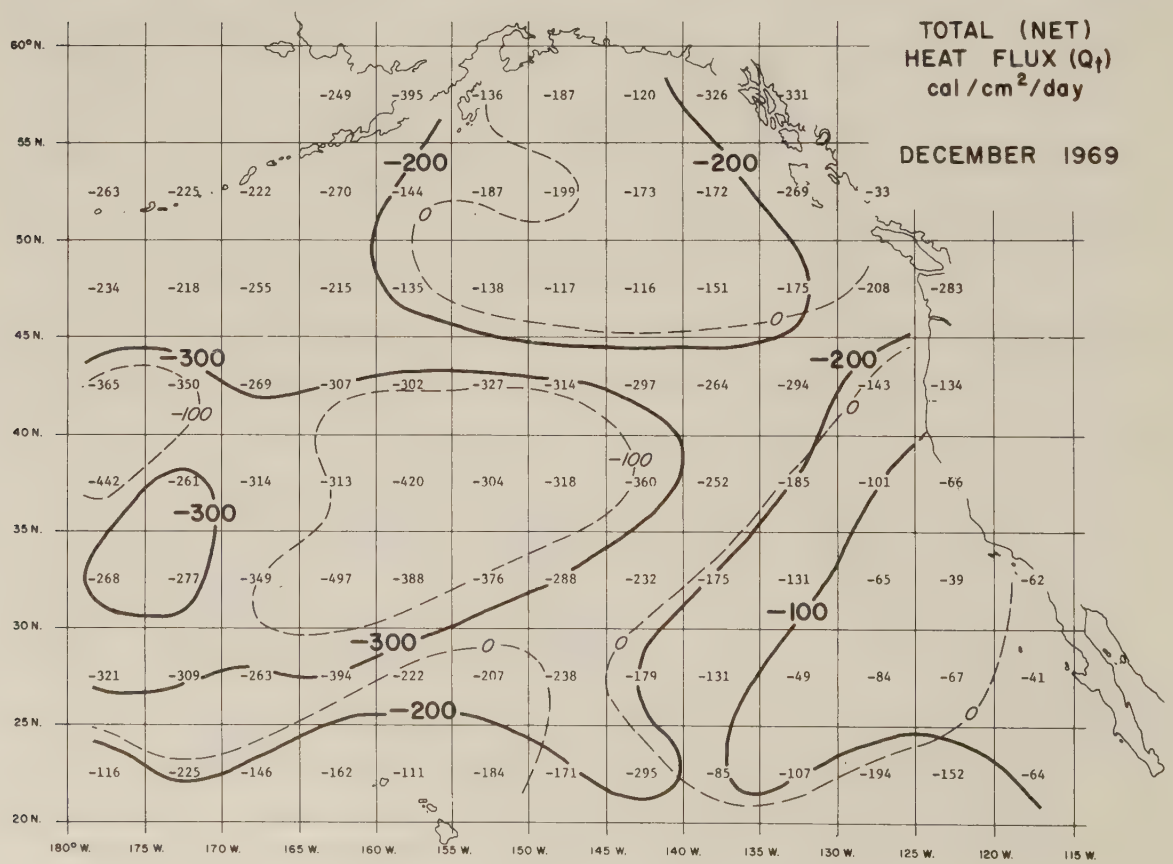
-344 -178 -116 -65 -146 -77 47 -39 -43 -48 -105 -20 45


TOTAL (NET)
HEAT FLUX (Q_t)
cal/cm²/day
DECEMBER 1969
60°N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
-300
-200
-100
0
-249 -395 -136 -187 -120 -326 331
-263 -225 -222 -270 -144 -187 -199 -173 -172 -269 -33
-234 -218 -255 -215 -135 -138 -117 -116 -151 -175 -208 -283
-365 -350 -269 -307 -302 -327 -314 -297 -264 -294 -143 -134
-442 -261 -314 -313 -420 -304 -318 -360 -252 -185 -101 -66
-268 -277 -349 -497 -388 -376 -288 -232 -175 -131 -65 -39 -62
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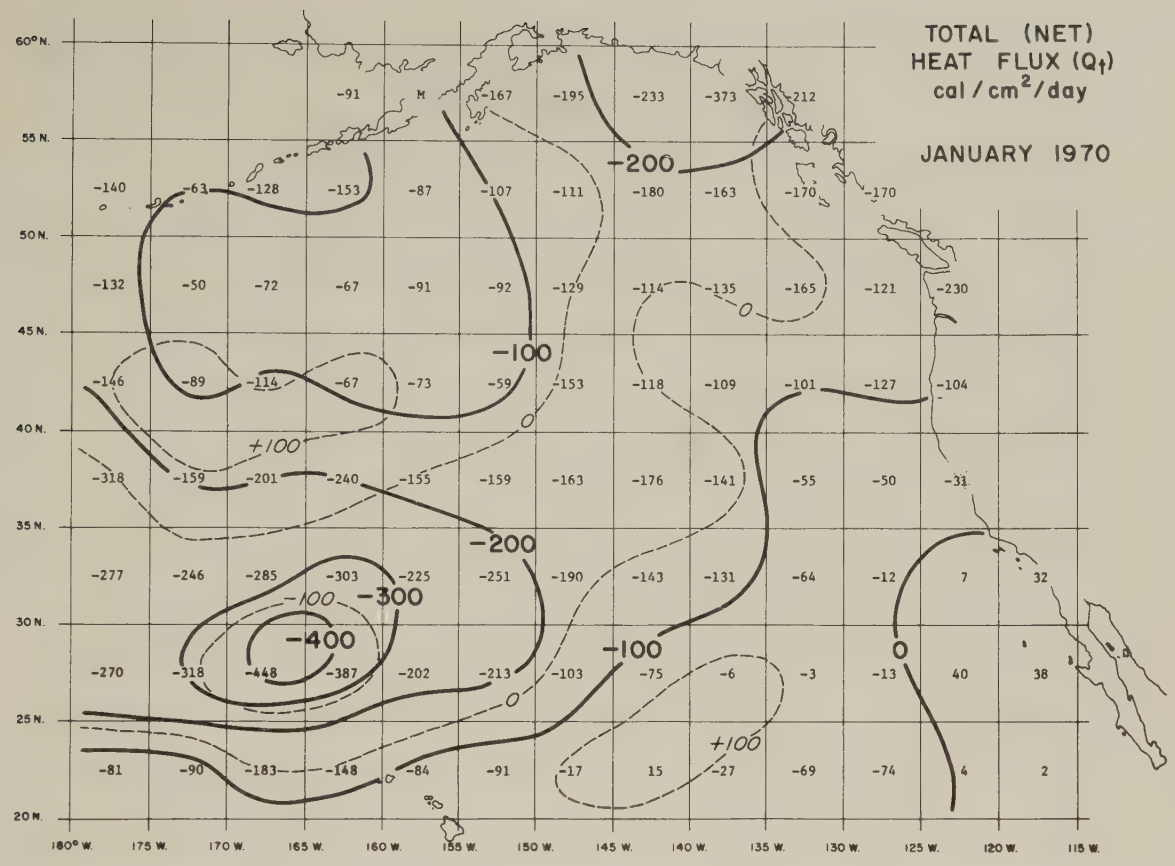
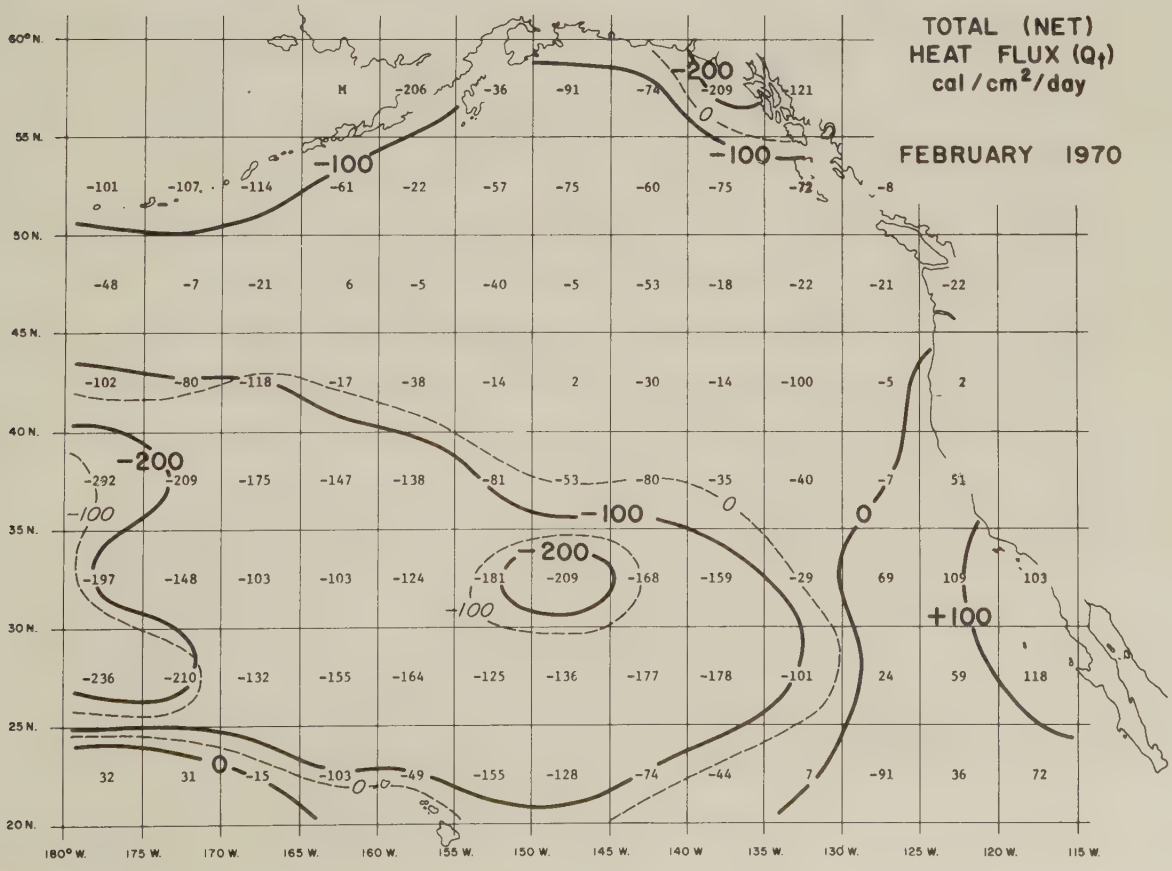
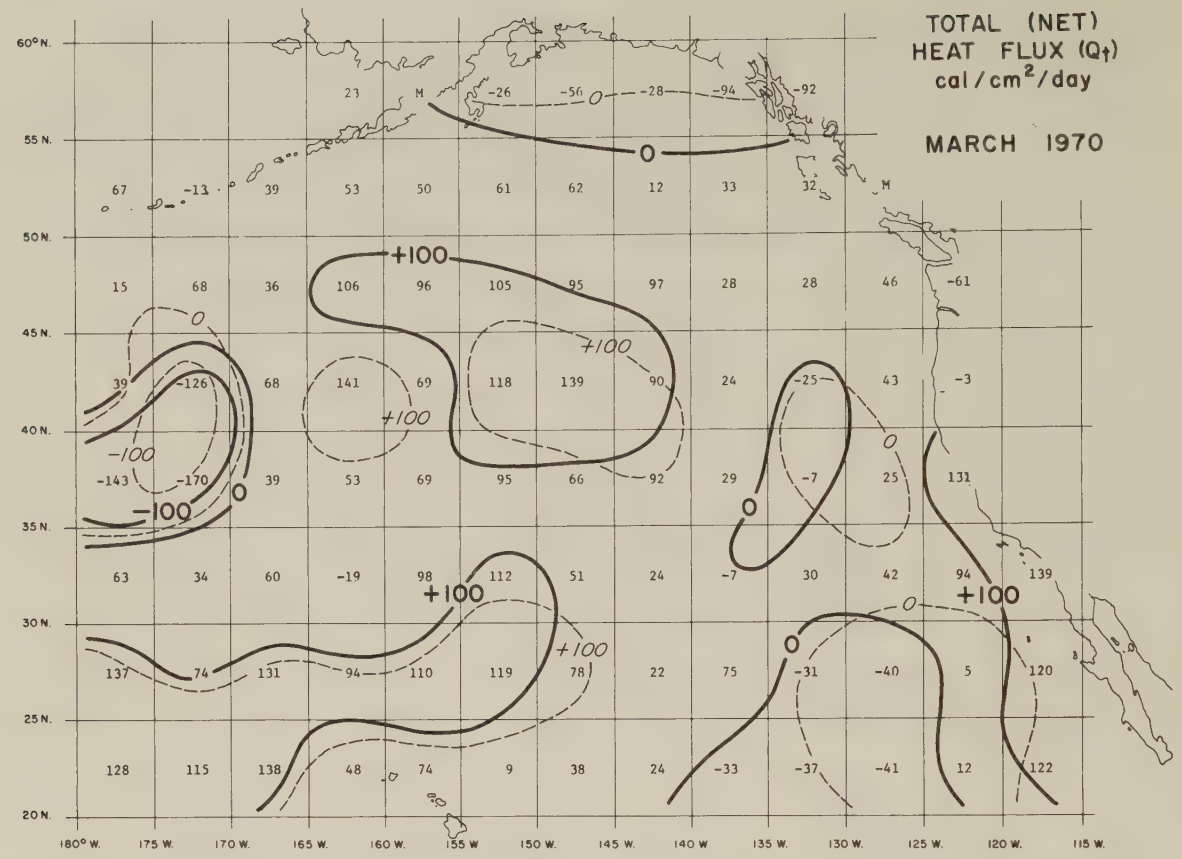
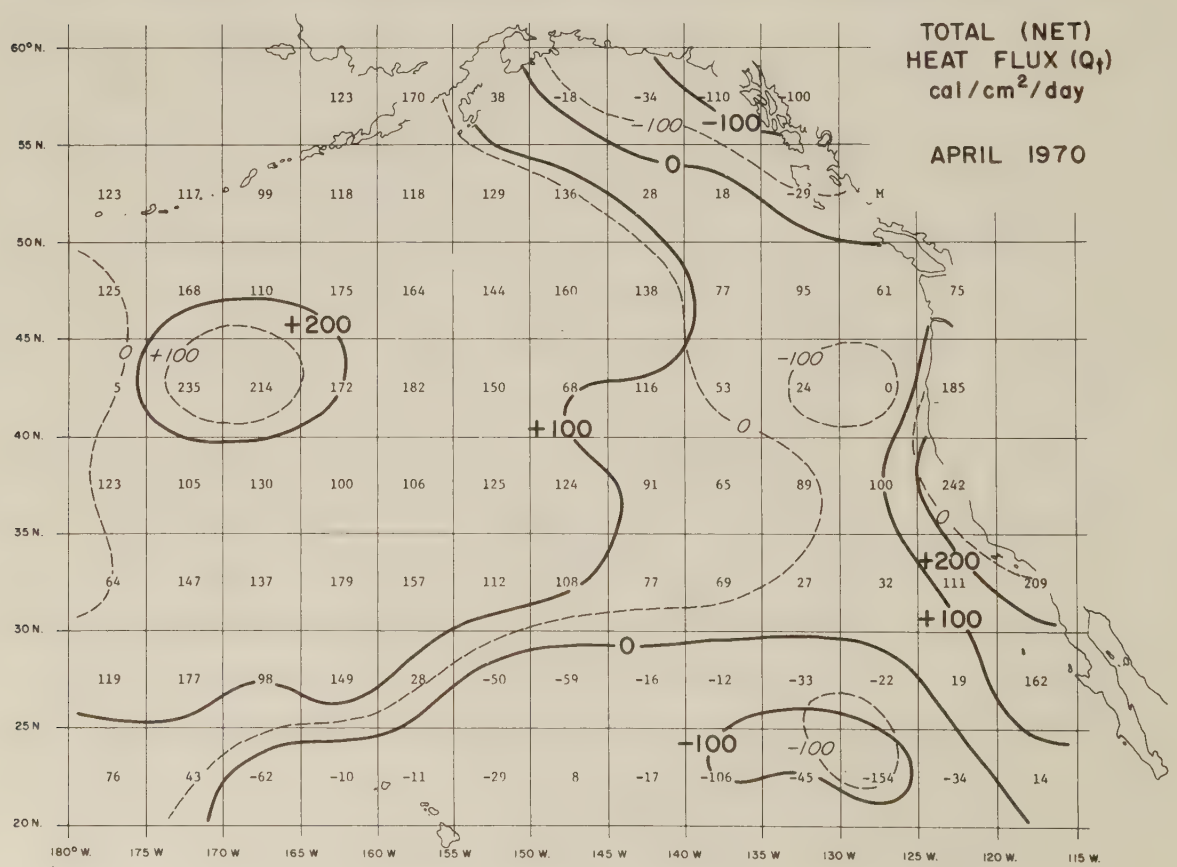
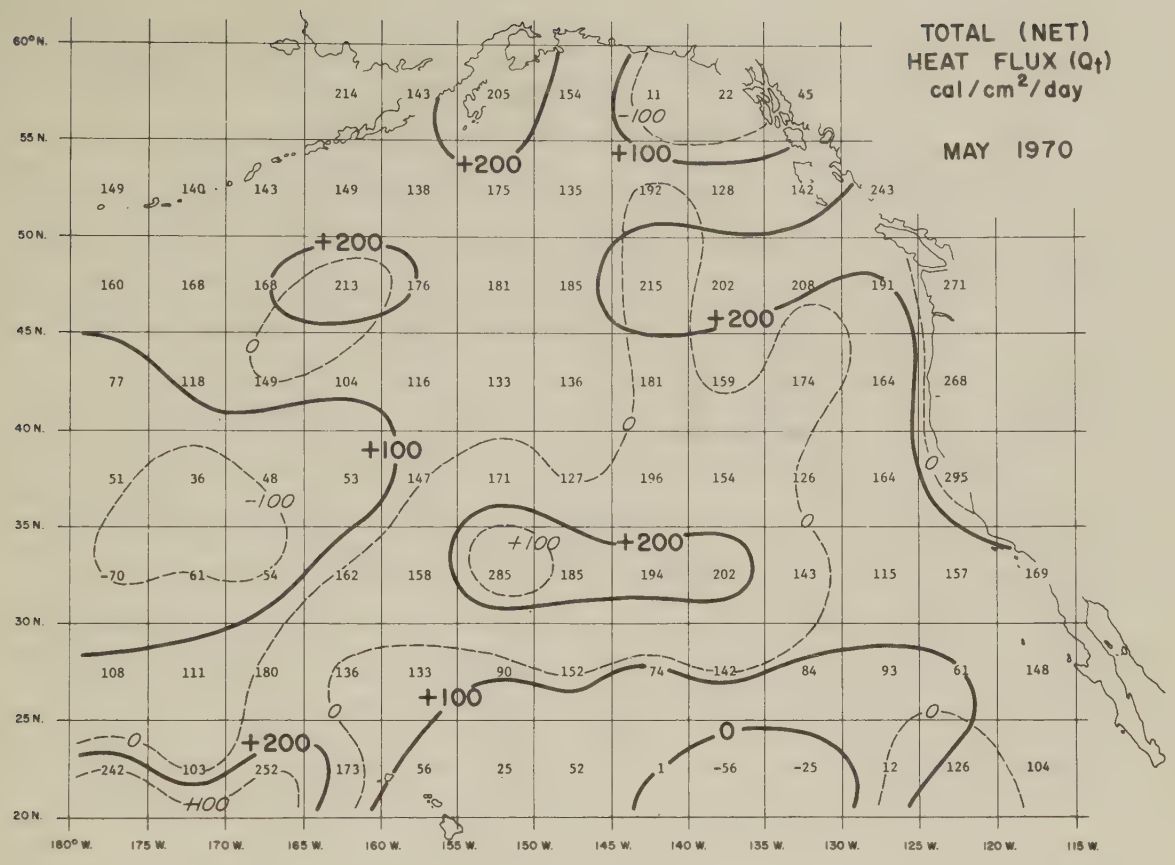
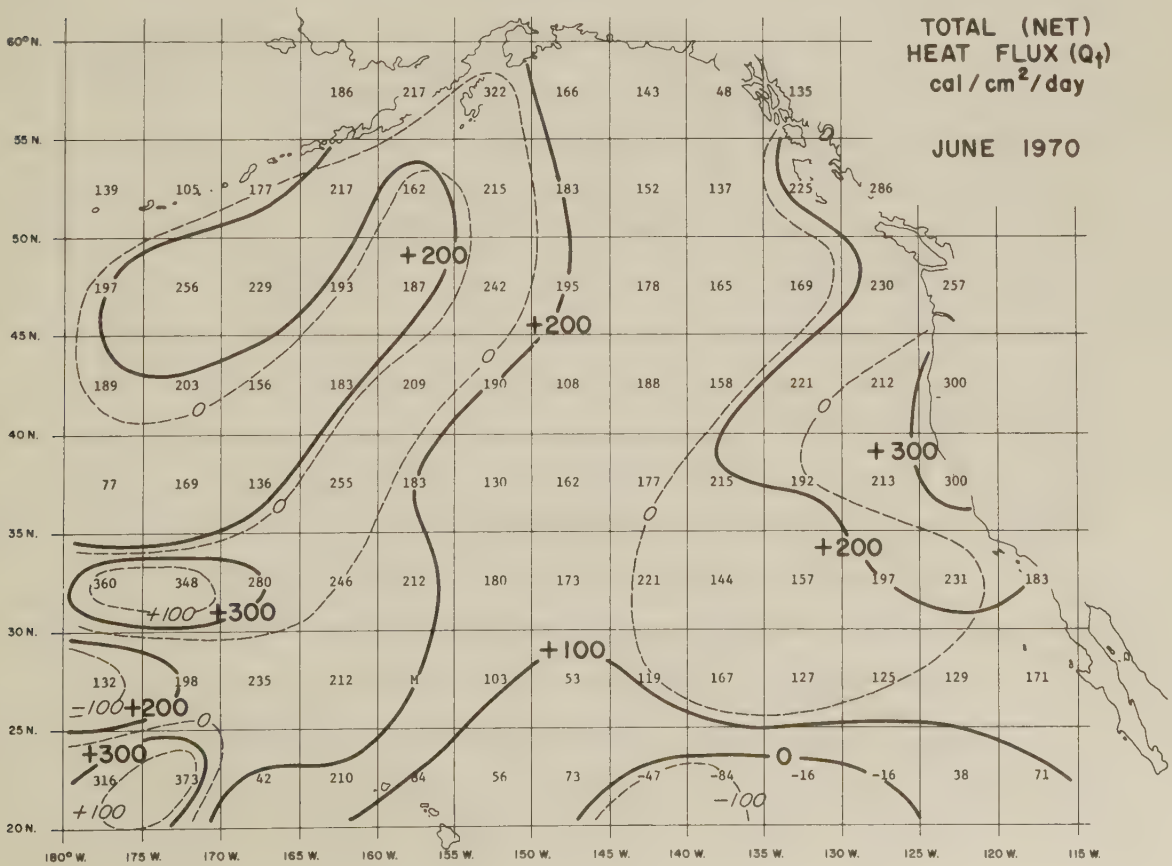

TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2/day
JANUARY 1970
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
-200
-100
0
+100
-300
-400

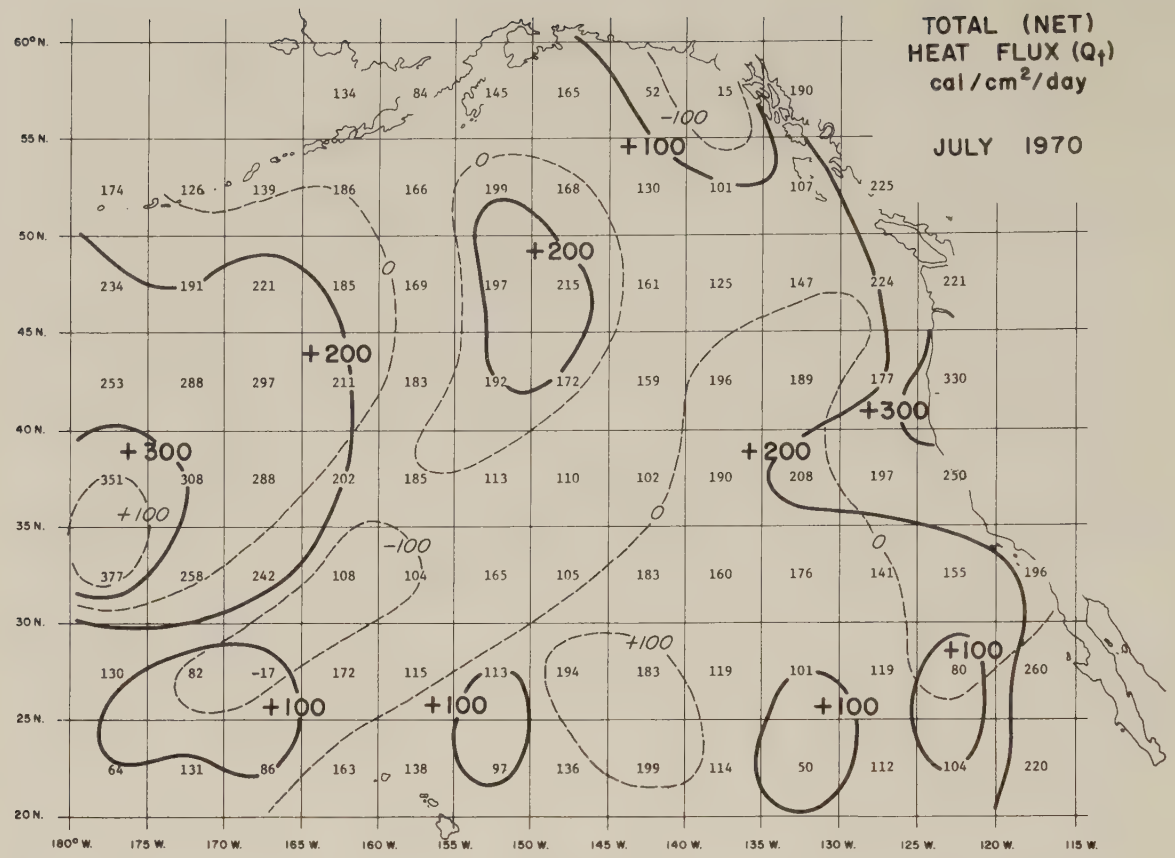

TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2/day
FEBRUARY 1970
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
-200
-100
0
+100

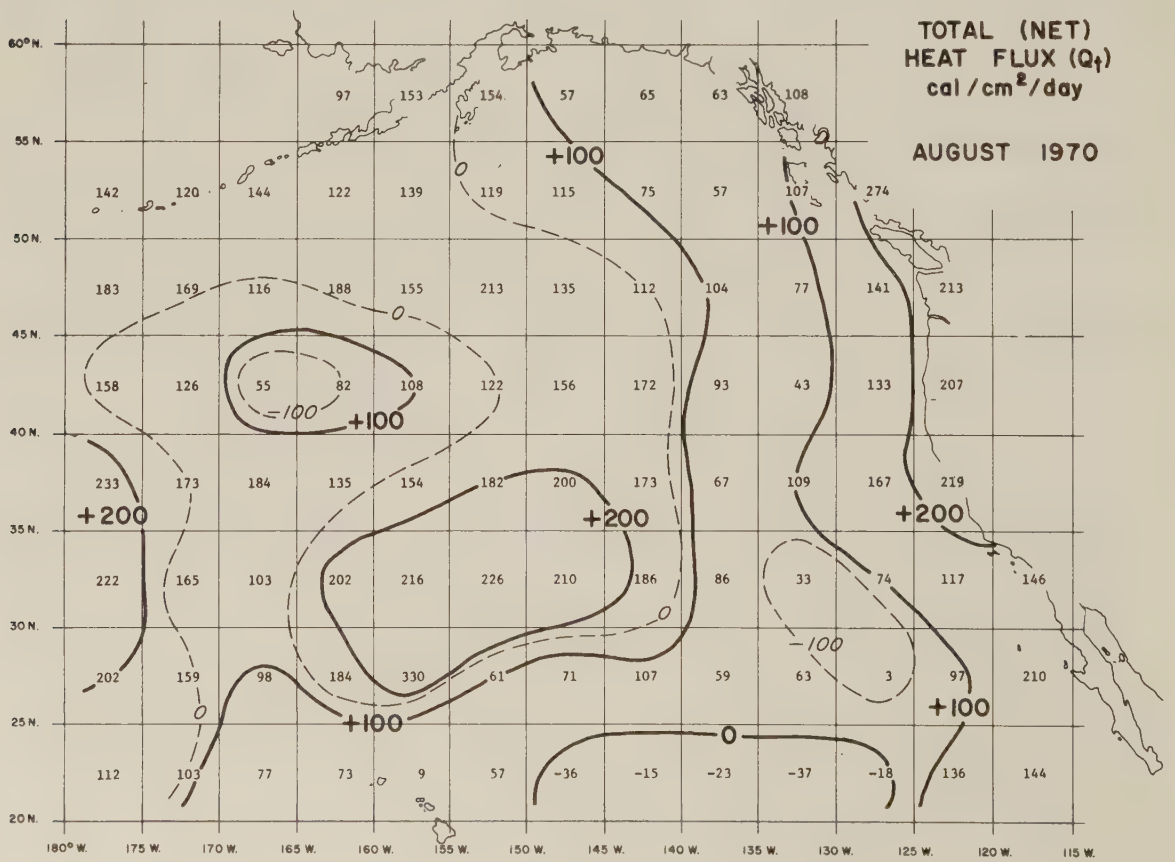

TOTAL (NET)
HEAT FLUX (Qt)
cal/cm²/day
MARCH 1970
60°N.
55 N.
50N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W
150 W.
145 W.
140 W
135 W.
130 W.
125 W.
120 W.
115 W.
+100
0
-100
+200

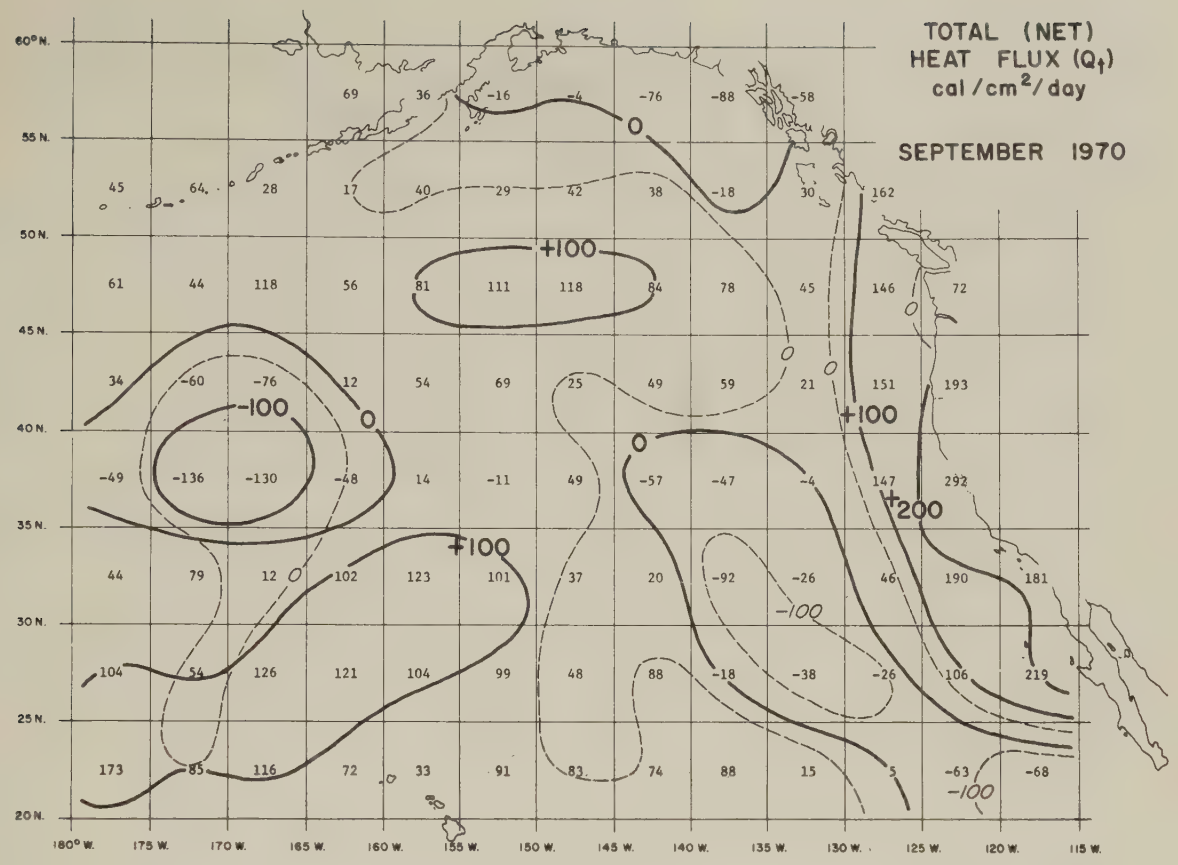

TOTAL (NET)
HEAT FLUX (Qt)
cal/cm²/day
APRIL 1970
60°N.
55 N.
50N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W
170 W
165 W
160 W
155 W
150 W.
145 W
140 W
135 W
130 W
125 W.
120 W.
115 W.
+200
+100
0
-100

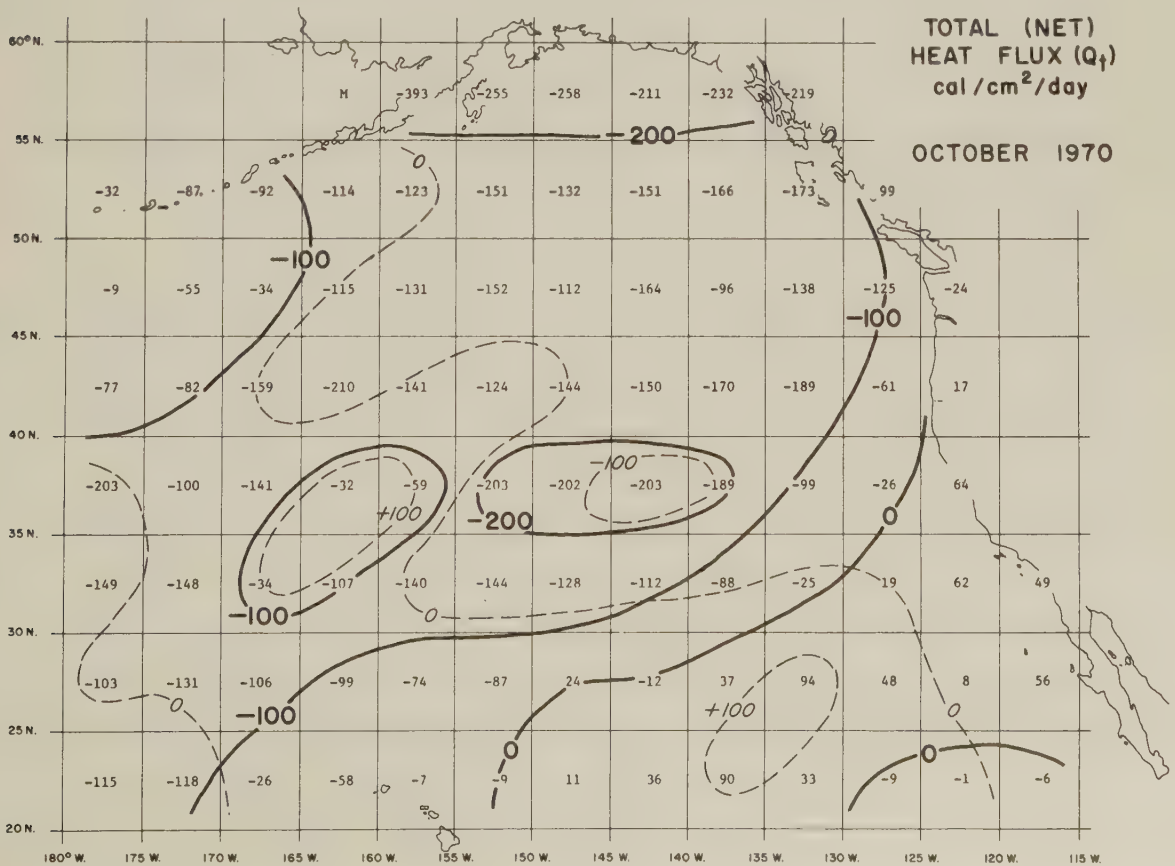

TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
MAY 1970
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
214 143 205 154 11 22 45
149 140 143 149 138 175 135 192 128 142 243
160 168 168 213 176 181 185 215 202 208 191 271
77 118 149 104 116 133 136 181 159 174 164 268
51 36 48 53 147 171 127 196 154 126 164 295
-70 61 54 162 158 285 185 194 202 143 115 157 169
108 111 180 136 133 90 152 74 142 84 93 61 148
-242 103 252 173 56 25 52 1 -56 -25 12 126 104
+200
+100
-100
0

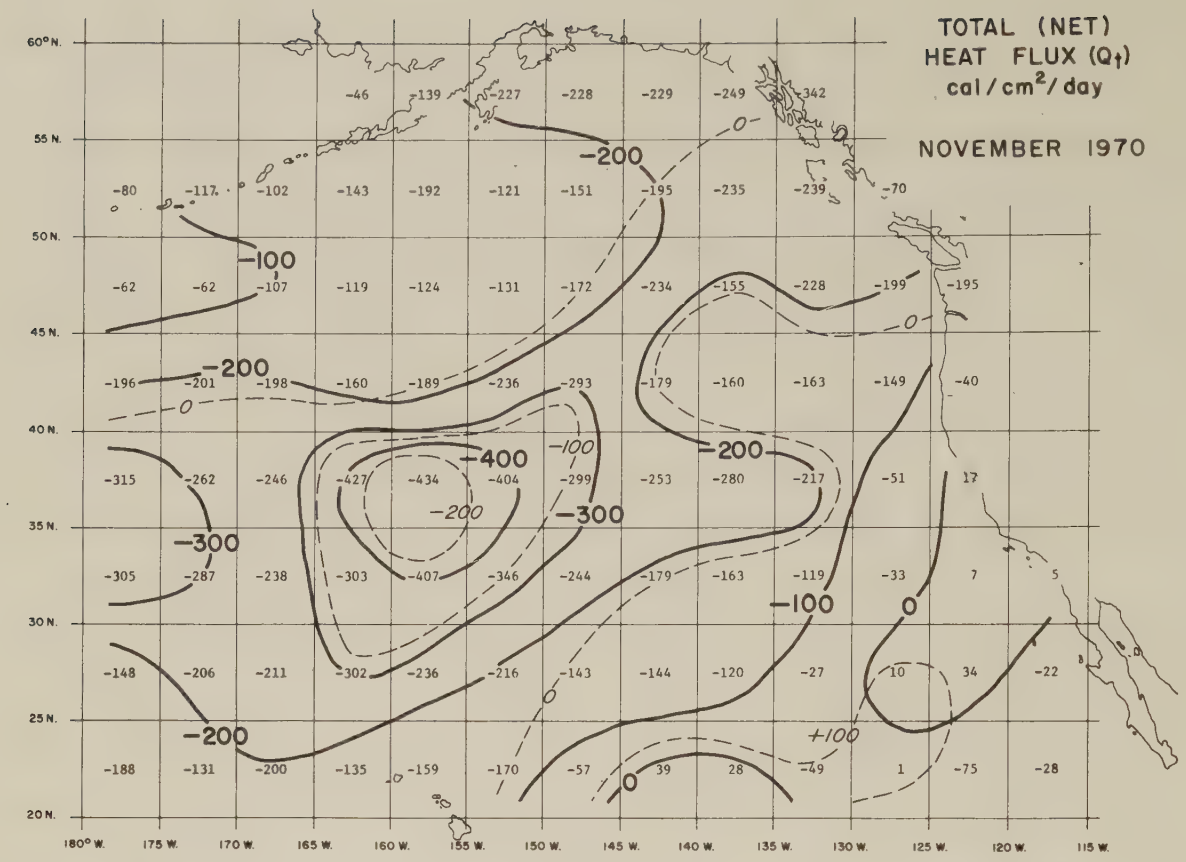

TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
JUNE 1970
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
186 217 322 166 143 48 135
139 105 177 217 162 215 183 152 137 225 286
197 256 229 193 187 242 195 178 165 169 230 257
189 203 156 183 209 190 108 188 158 221 212 300
77 169 136 255 183 130 162 177 215 192 213 300
360 348 280 246 212 180 173 221 144 157 197 231 183
132 198 235 212 M 103 53 119 167 127 125 129 171
316 373 42 210 84 56 73 -47 -84 -16 -16 38 71
+300
+200
+100
-100
0


TOTAL (NET)
HEAT FLUX (Q_t)
cal/cm²/day
JULY 1970
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+100
+200
+300
-100
0


TOTAL (NET)
HEAT FLUX (Q_t)
cal/cm²/day
AUGUST 1970
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+100
+200
-100
0


TOTAL (NET)
HEAT FLUX (Q_t)
cal/cm²/day
SEPTEMBER 1970
60°N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+100
-100
+200
-200
0


TOTAL (NET)
HEAT FLUX (Q_t)
cal/cm²/day
OCTOBER 1970
60°N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+100
-100
-200
0


TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
NOVEMBER 1970
60°N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
-46 -139 -227 -228 -229 -249 342
-80 -117 -102 -143 -192 -121 -151 -195 -235 -239 -70
-62 -62 -107 -119 -124 -131 -172 -234 -155 -228 -199 -195
-196 -201 -198 -160 -189 -236 -293 -179 -160 -163 -149 -40
-315 -262 246 -427 -434 -404 -299 -253 -280 -217 -51 17
-305 -287 -238 -303 -407 -346 -244 -179 -163 -119 -33 7 5
-148 -206 -211 -302 -236 -216 -143 -144 -120 -27 10 34 -22
-188 -131 -200 -135 -159 -170 -57 39 28 -49 1 -75 -28
-200
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-300
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-200
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0
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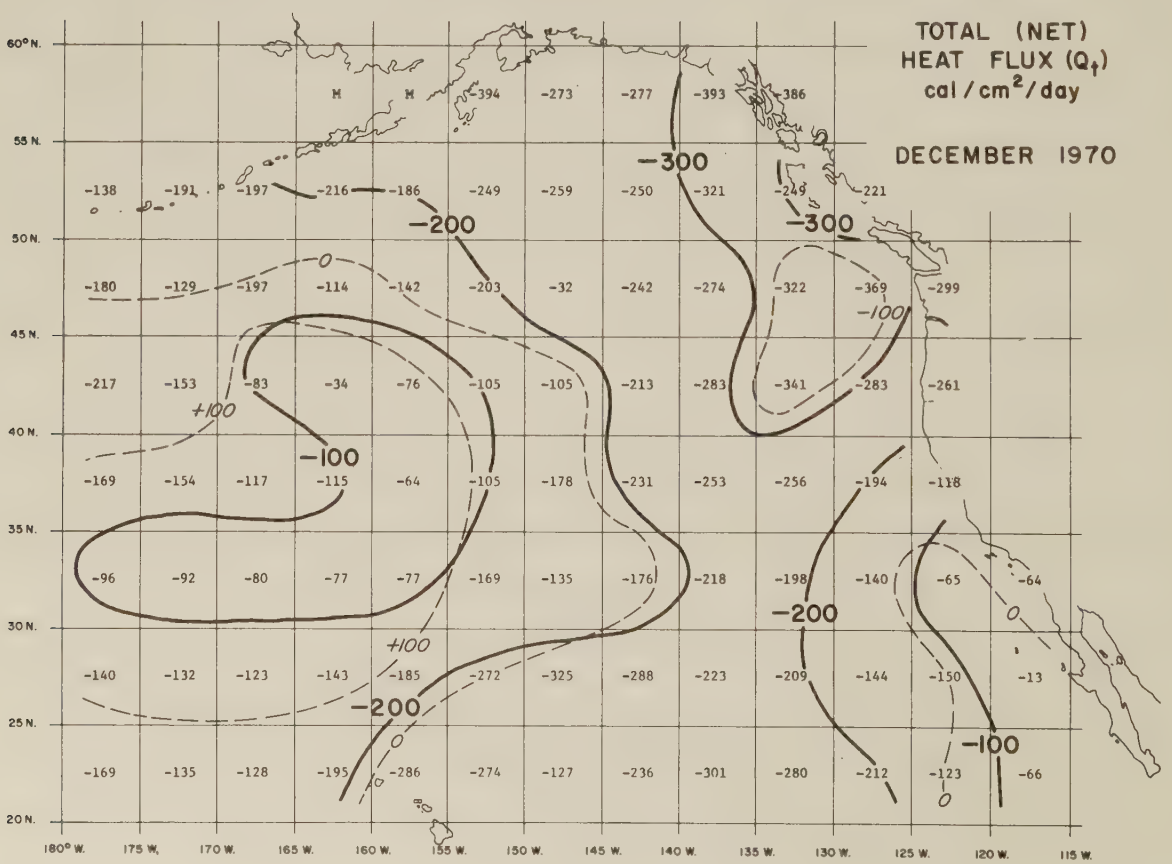
0
+100


TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
DECEMBER 1970
60°N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
M M 394 -273 -277 -393 386
-138 -191 -197 -216 -186 -249 -259 -250 -321 -249 221
-180 -129 -197 -114 -142 -203 -32 -242 -274 -322 -369 -299
-217 -153 -83 -34 -76 -105 -105 -213 -283 -341 -283 -261
-169 -154 -117 -115 -64 -105 -178 -231 -253 -256 -194 -118
-96 -92 -80 -77 -77 -169 -135 -176 -218 -198 -140 -65 -64
-140 -132 -123 -143 -185 -272 -325 -288 -223 -209 -144 -150 -13
-169 -135 -128 -195 -286 -274 -127 -236 -301 -280 -212 -123 -66
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-200
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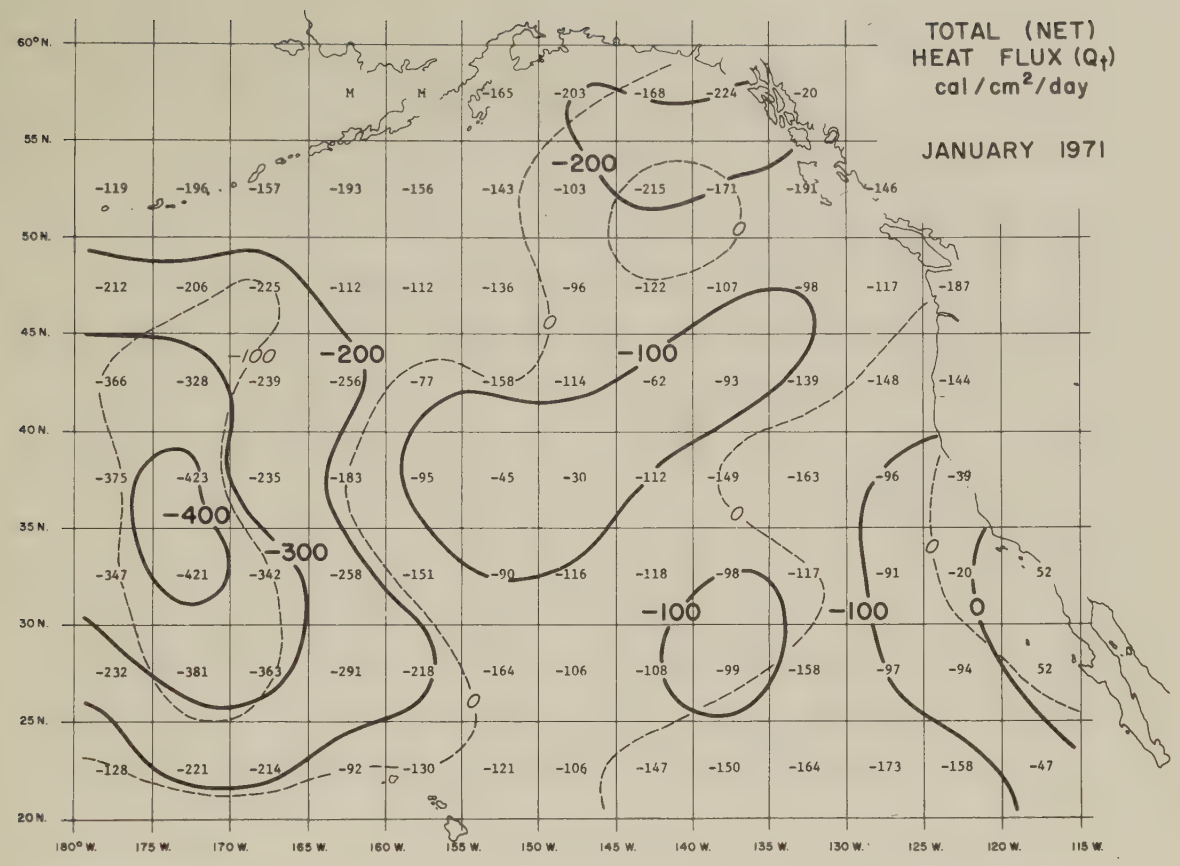
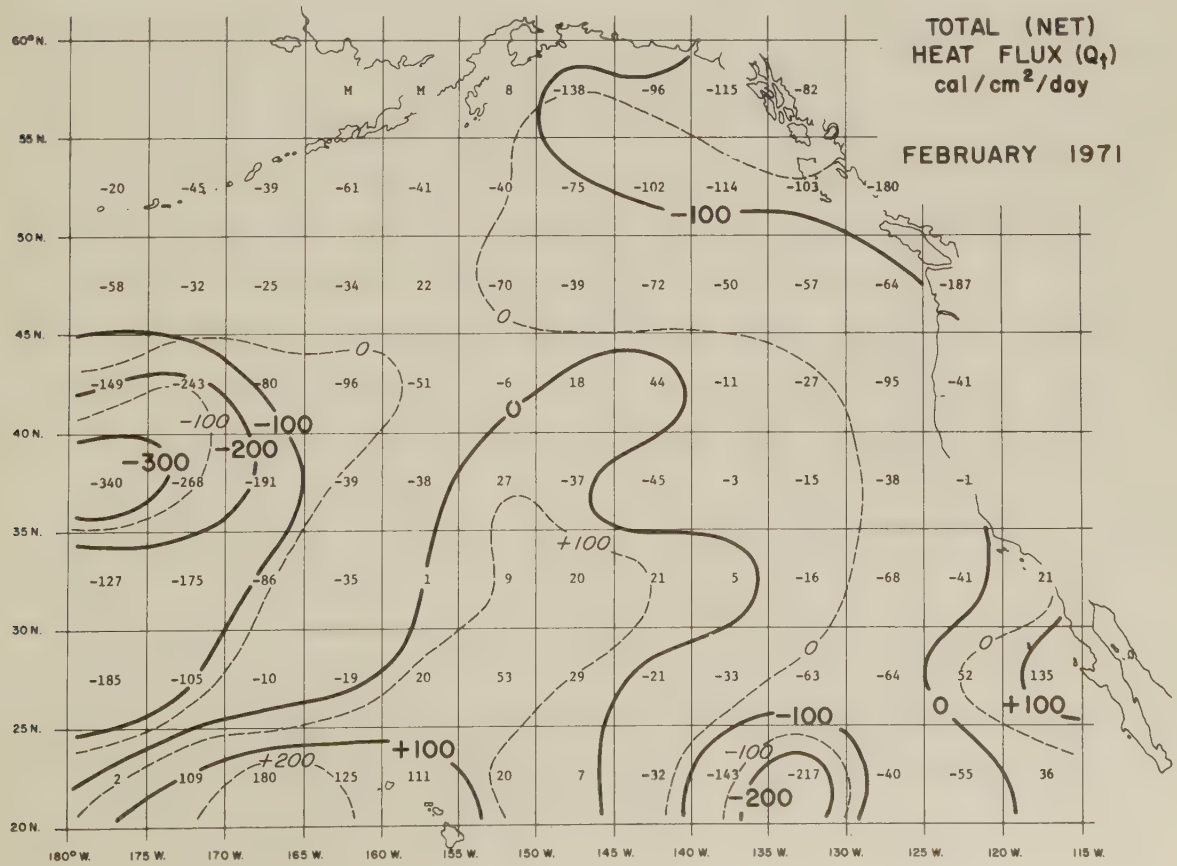
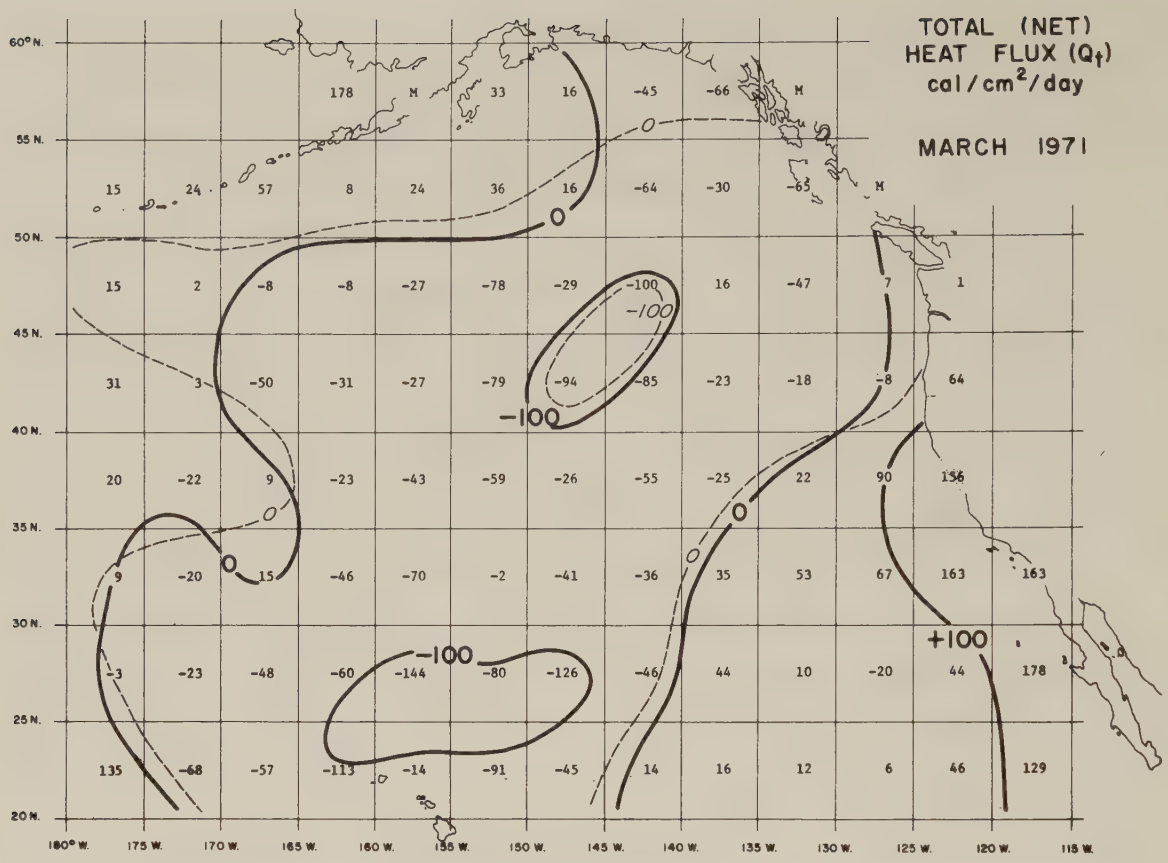
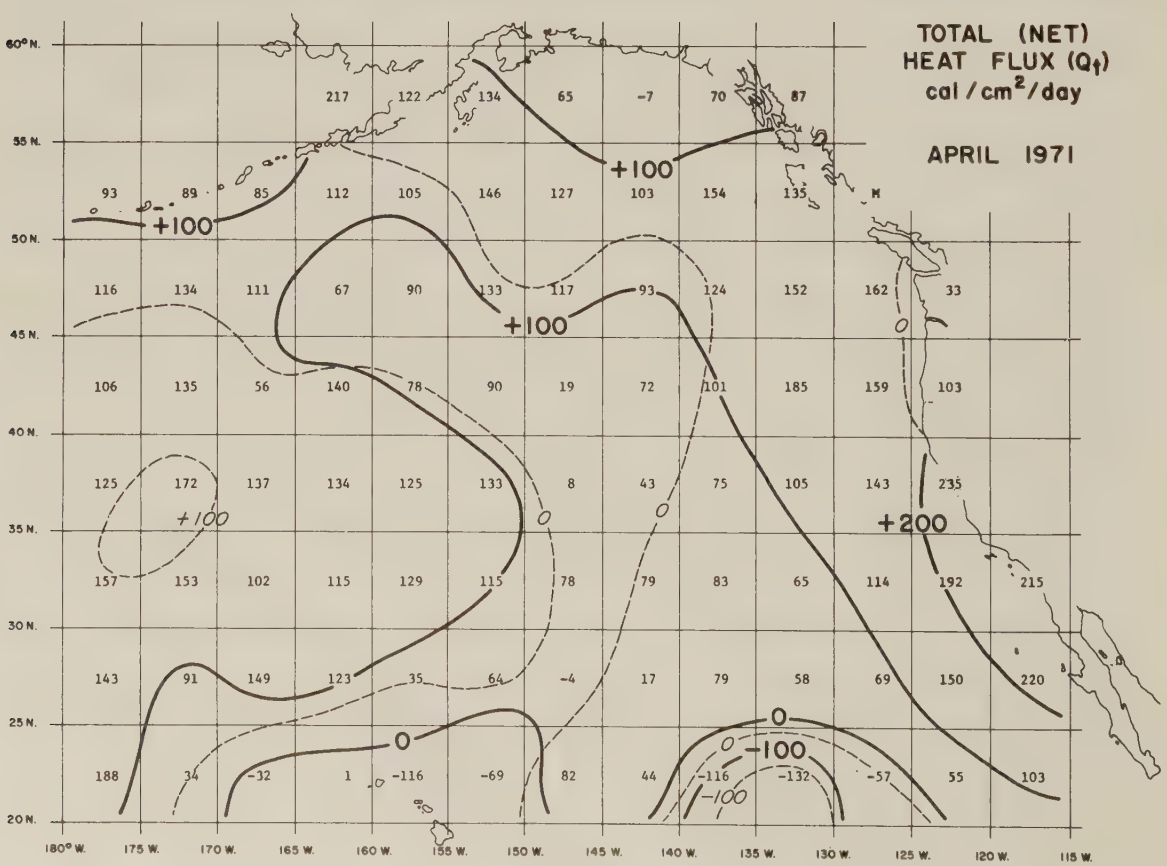
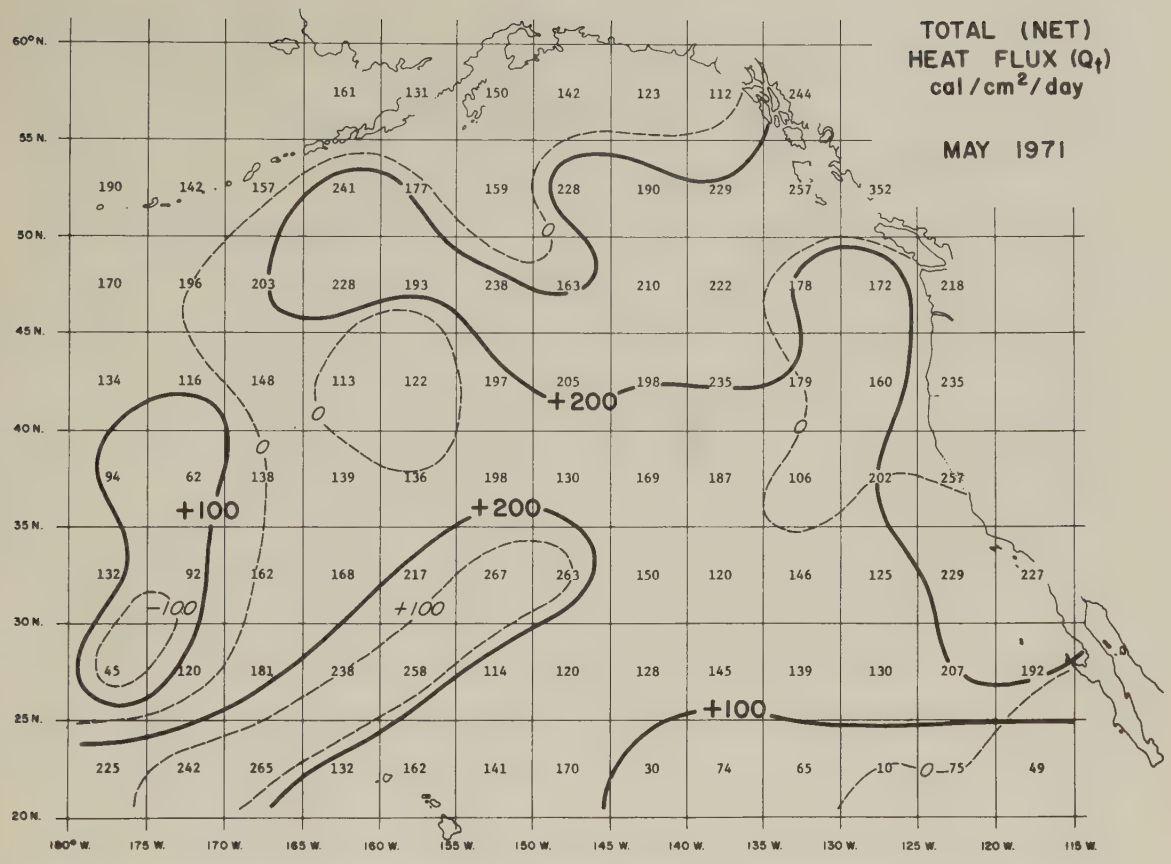
+100

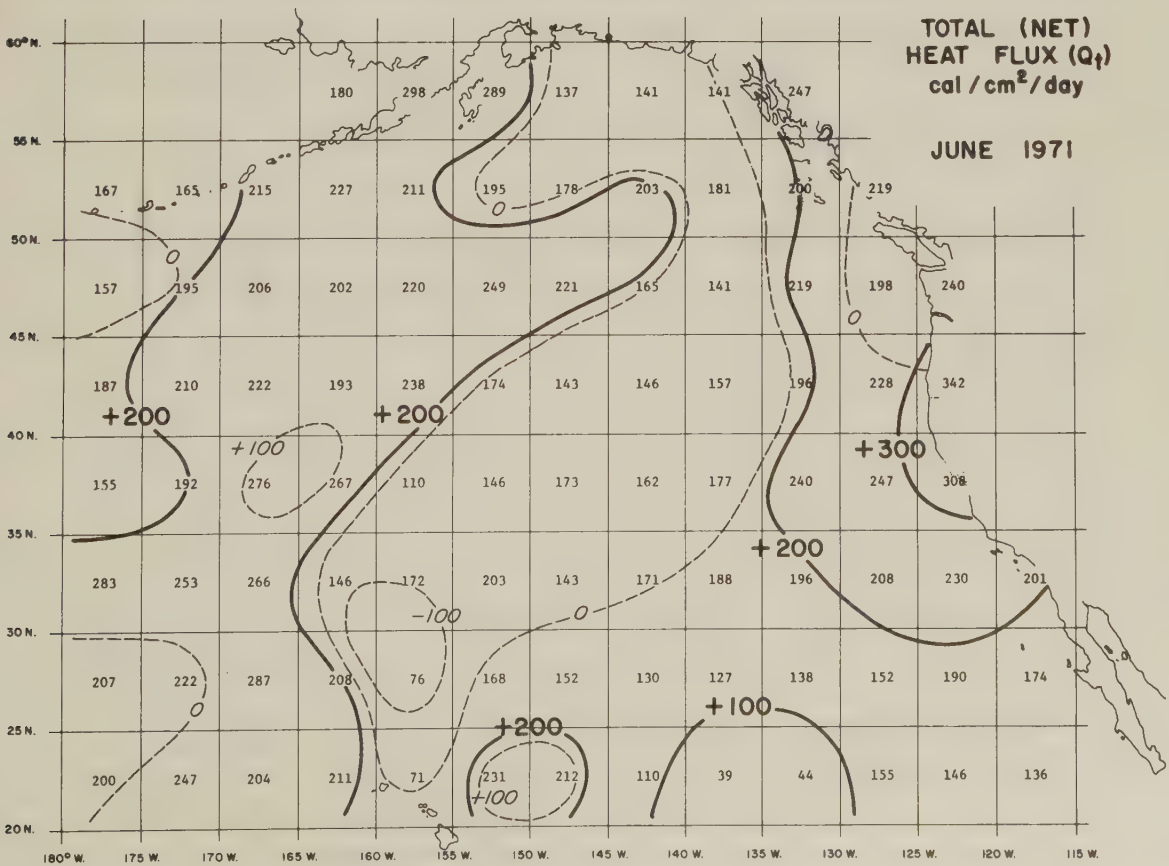

TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
JANUARY 1971
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
-200
-100
-400
-300
0

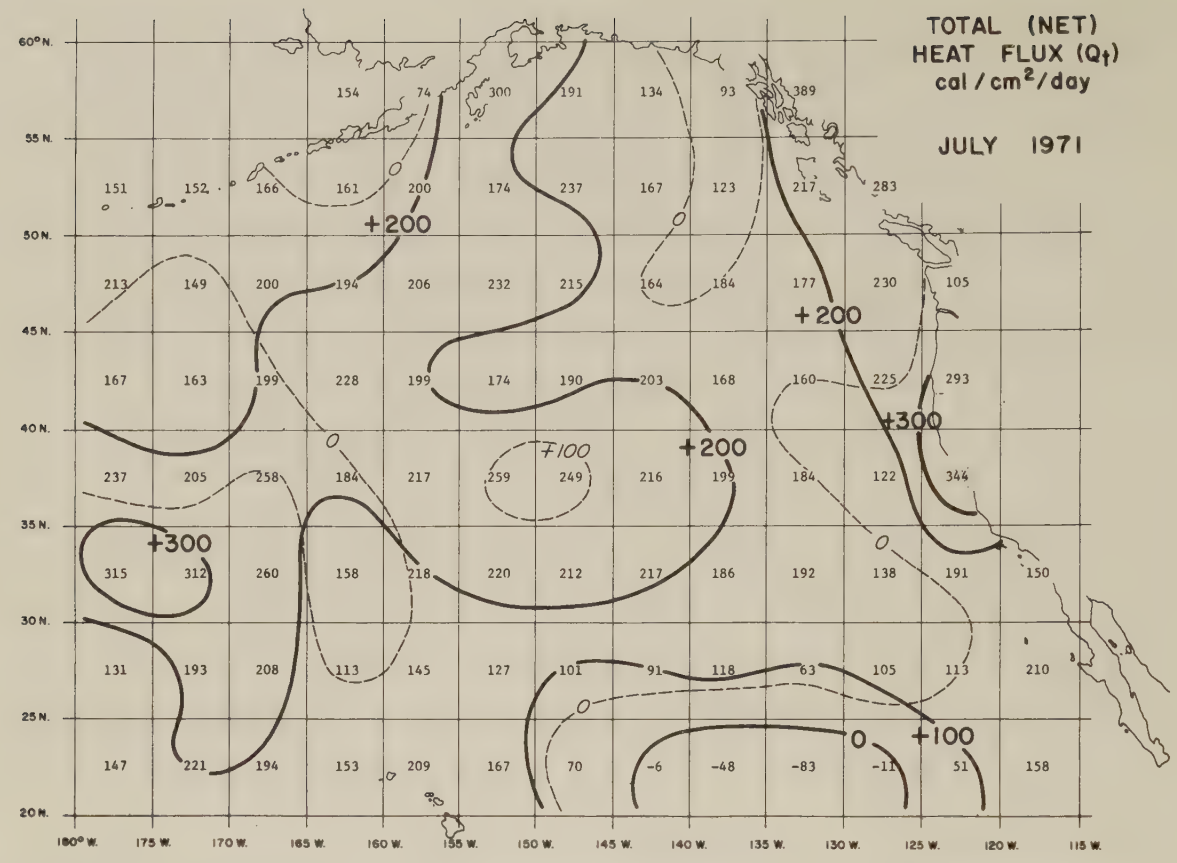

TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
FEBRUARY 1971
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
-100
-300
-200
+100
+200
0

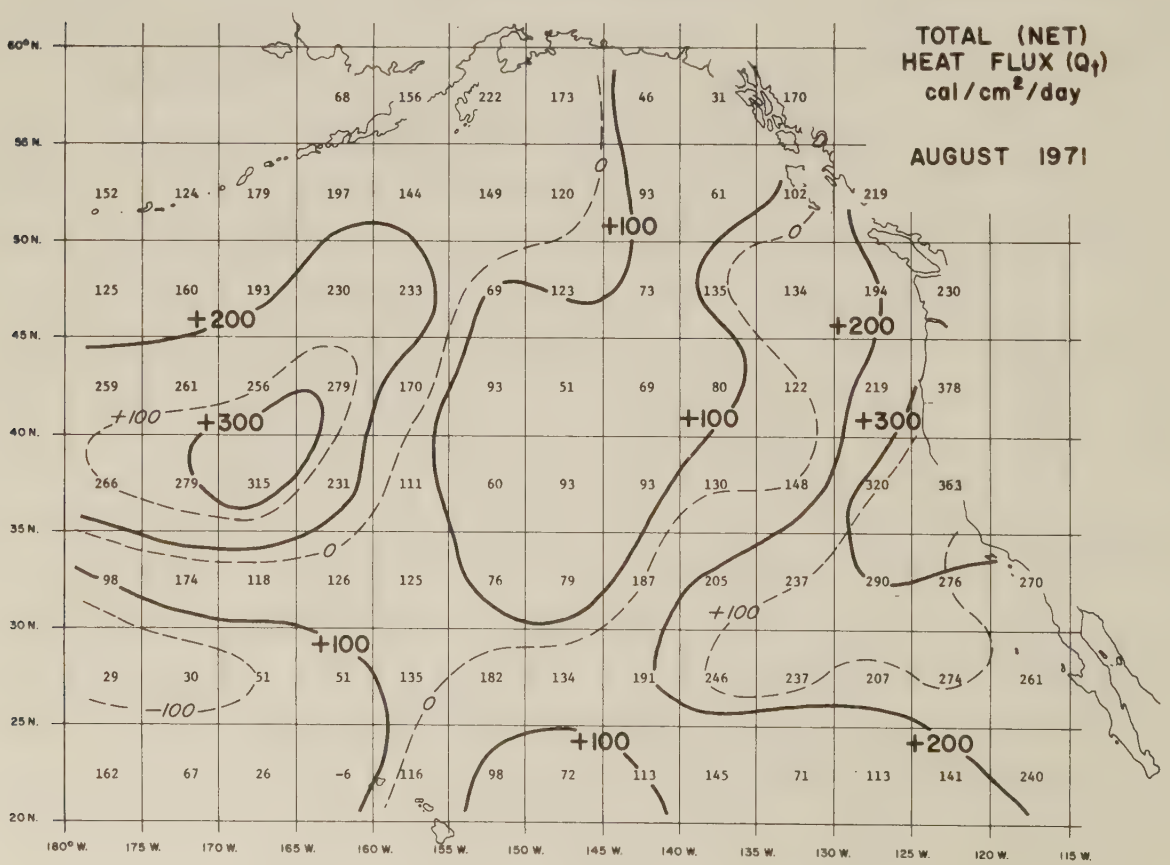

TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
MARCH 1971
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
178 M 33 16 -45 -66 M
15 24 57 8 24 36 16 -64 -30 -65 M
15 2 -8 -8 -27 -78 -29 -100 16 -47 7 1
31 3 -50 -31 -27 -79 -94 -85 -23 -18 -8 64
20 -22 9 -23 -43 -59 -26 -55 -25 22 90 156
9 -20 15 -46 -70 -2 -41 -36 35 53 67 163 163
-3 -23 -48 -60 -144 -80 -126 -46 44 10 -20 44 178
135 -68 -57 -113 -14 -91 -45 14 16 12 6 46 129
0
-100
+100

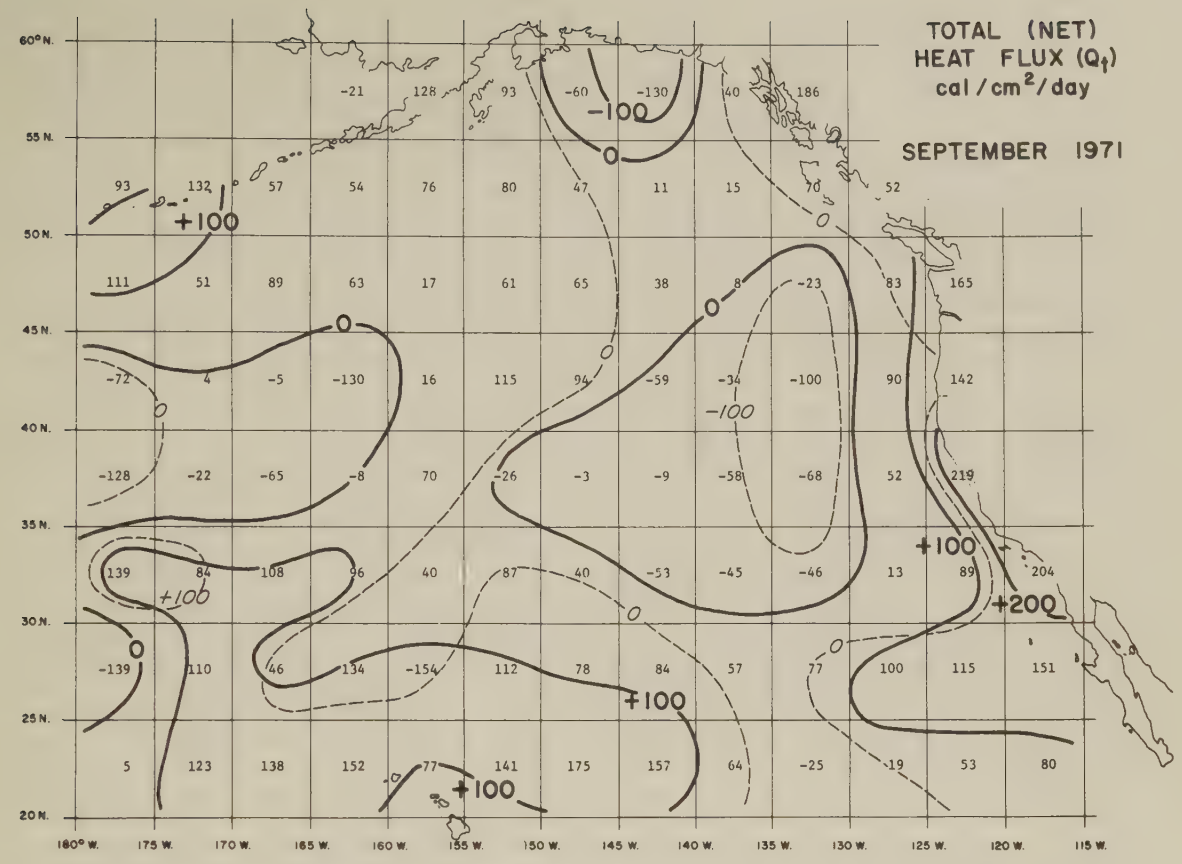

TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
APRIL 1971
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
217 122 134 65 -7 70 87
93 89 85 112 105 146 127 103 154 135 M
116 134 111 67 90 133 117 93 124 152 162 33
106 135 56 140 78 90 19 72 101 185 159 103
125 172 137 134 125 133 8 43 75 105 143 235
157 153 102 115 129 115 78 79 83 65 114 192 215
143 91 149 123 35 64 -4 17 79 58 69 150 220
188 34 -32 1 -116 -69 82 44 -116 -132 -57 55 103
0
+100
+200
-100

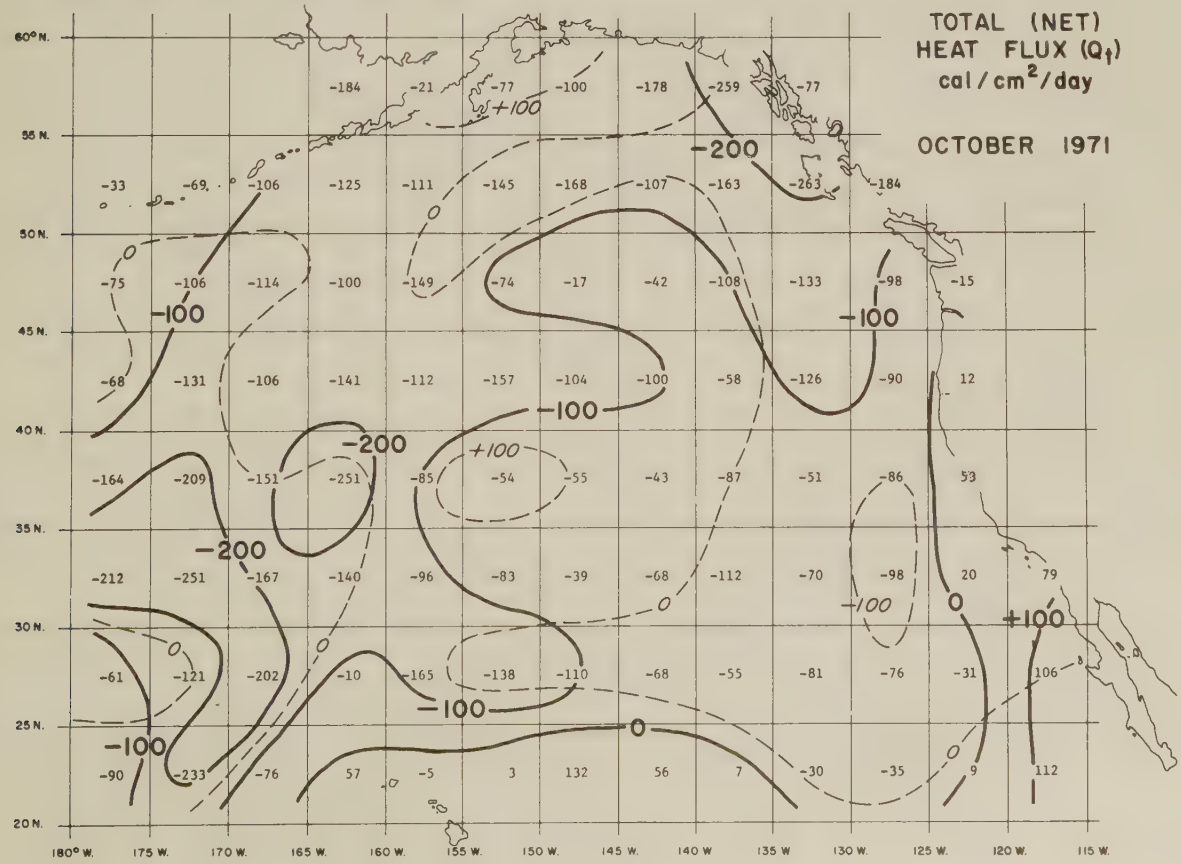

TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
MAY 1971
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+100
+200
-100
+100
+200
+100

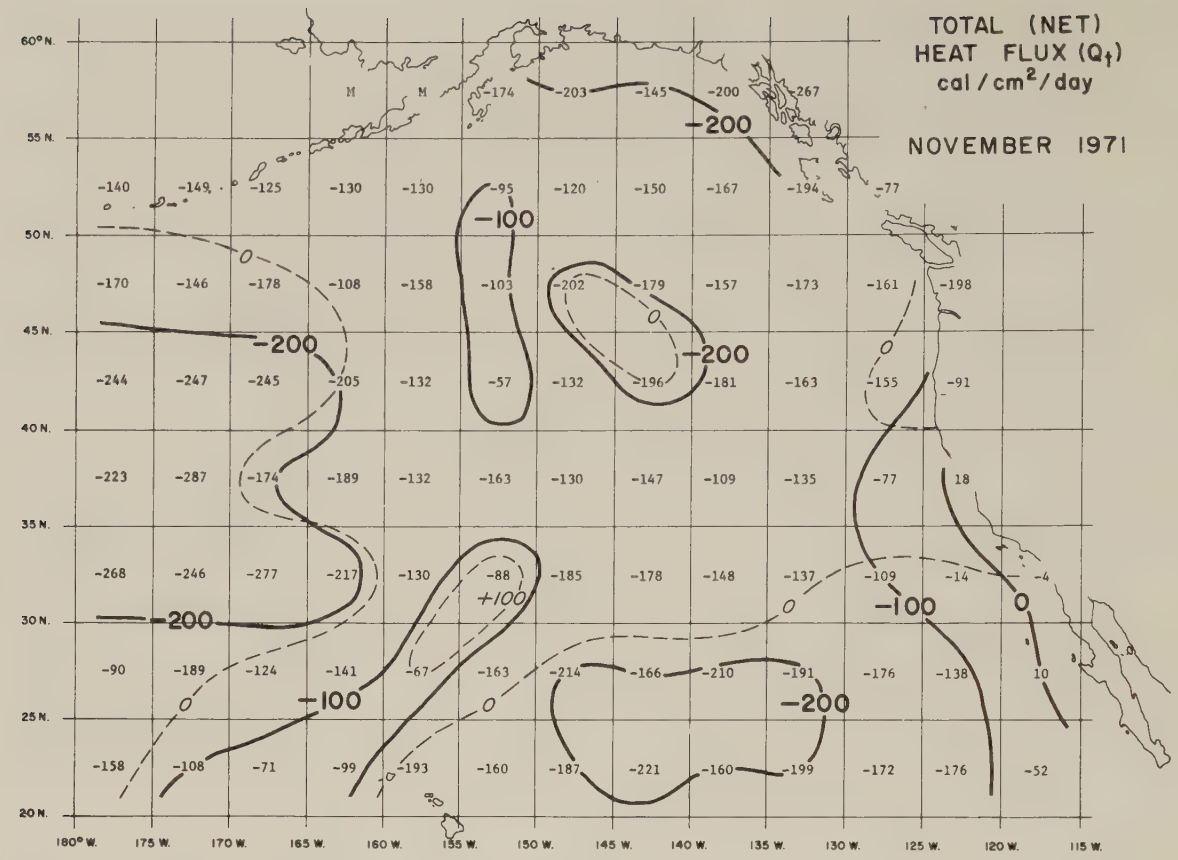

TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
JUNE 1971
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+200
+200
+100
+300
+200
-100
+200
+100
+100

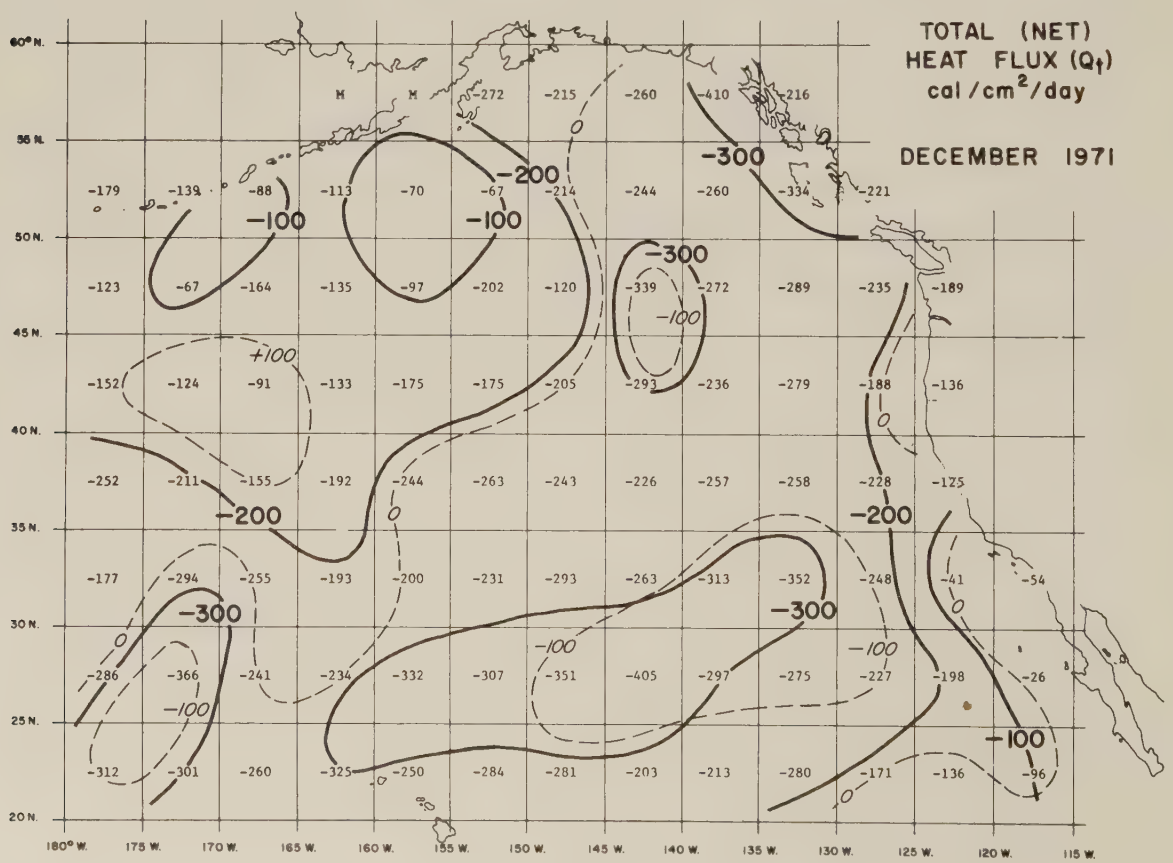

TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
JULY 1971
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+200
+300
+100
0
-100


TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
AUGUST 1971
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+200
+300
+100
0
-100

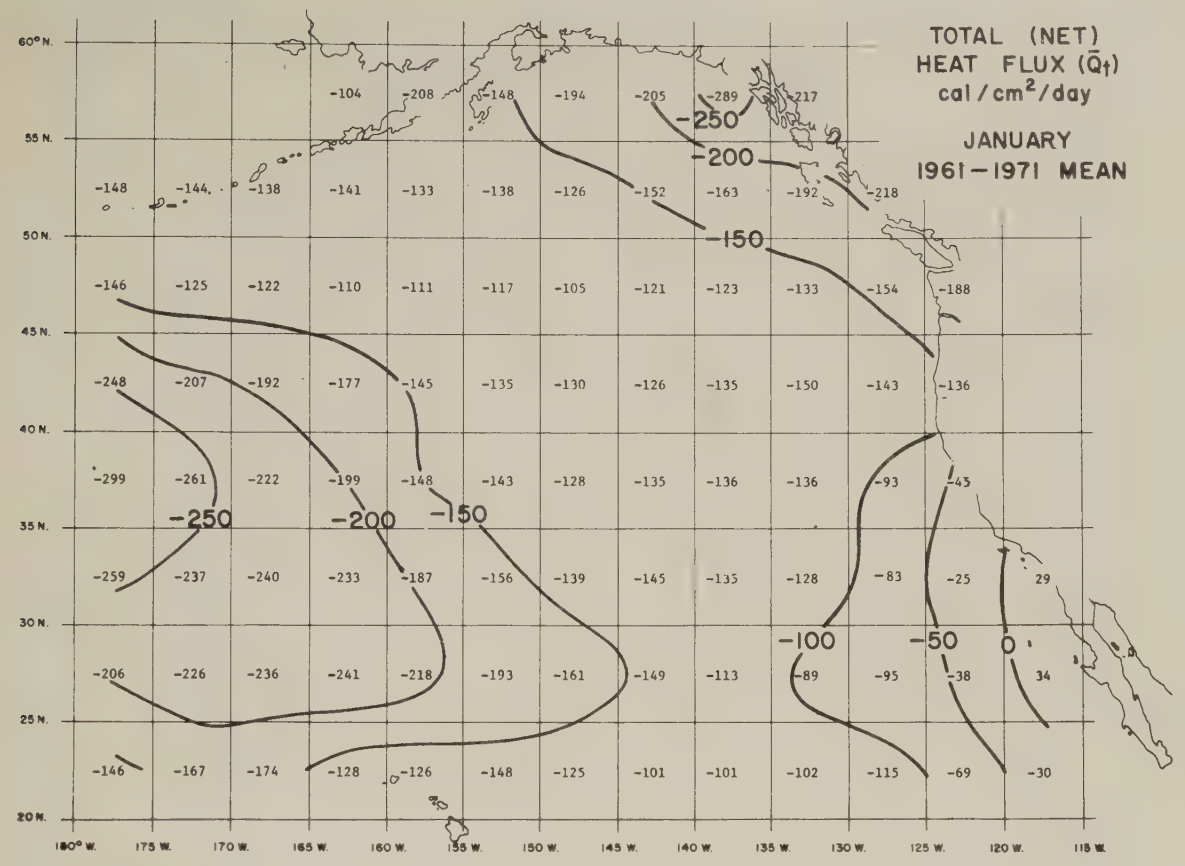

TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
SEPTEMBER 1971
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+100
0
-100
+200

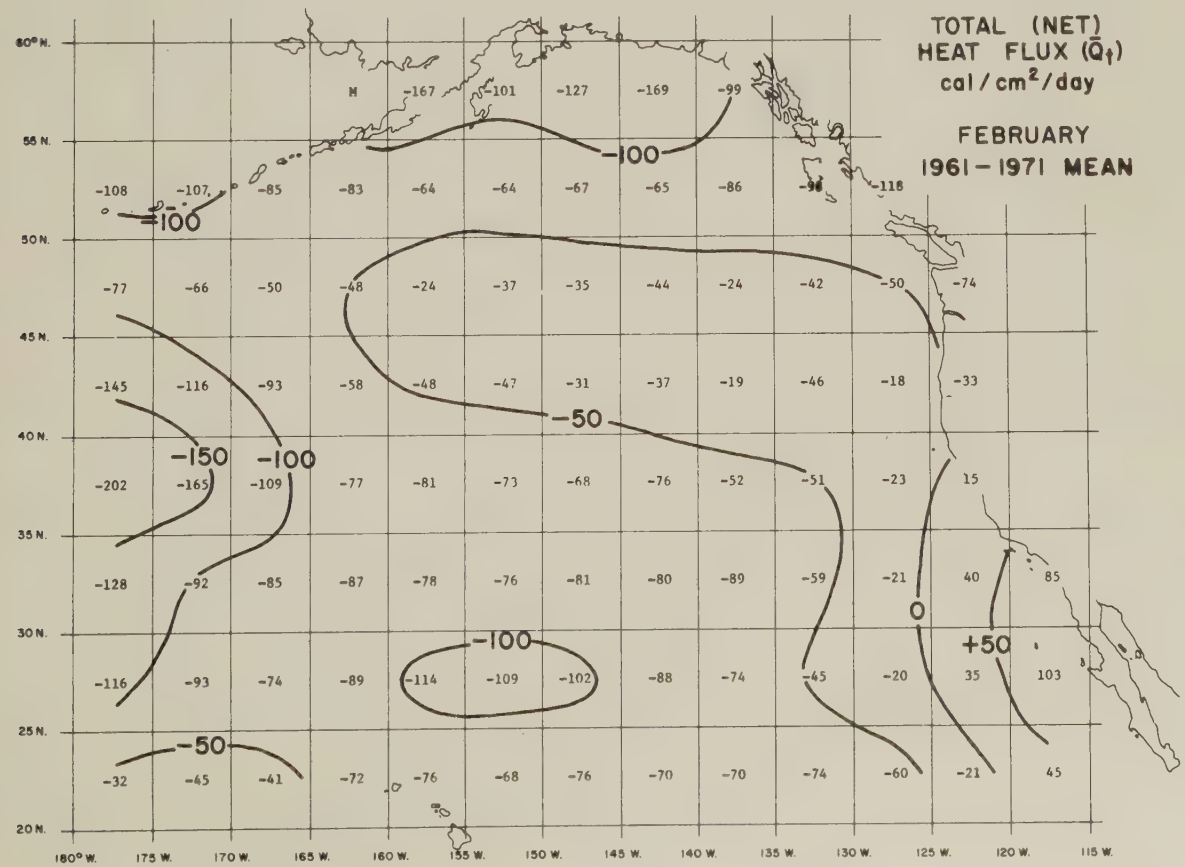

TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
OCTOBER 1971
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+100
0
-100
-200

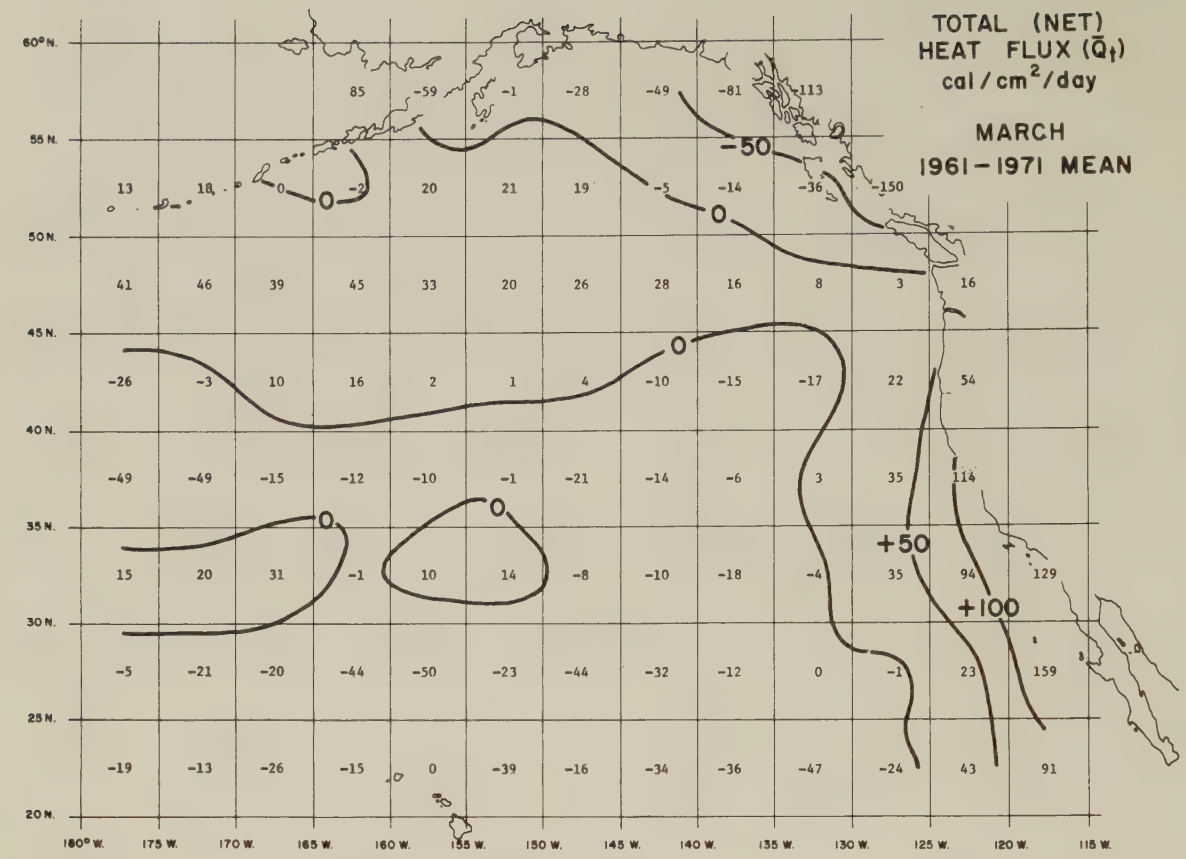

TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
NOVEMBER 1971
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
-200
-100
0
+100

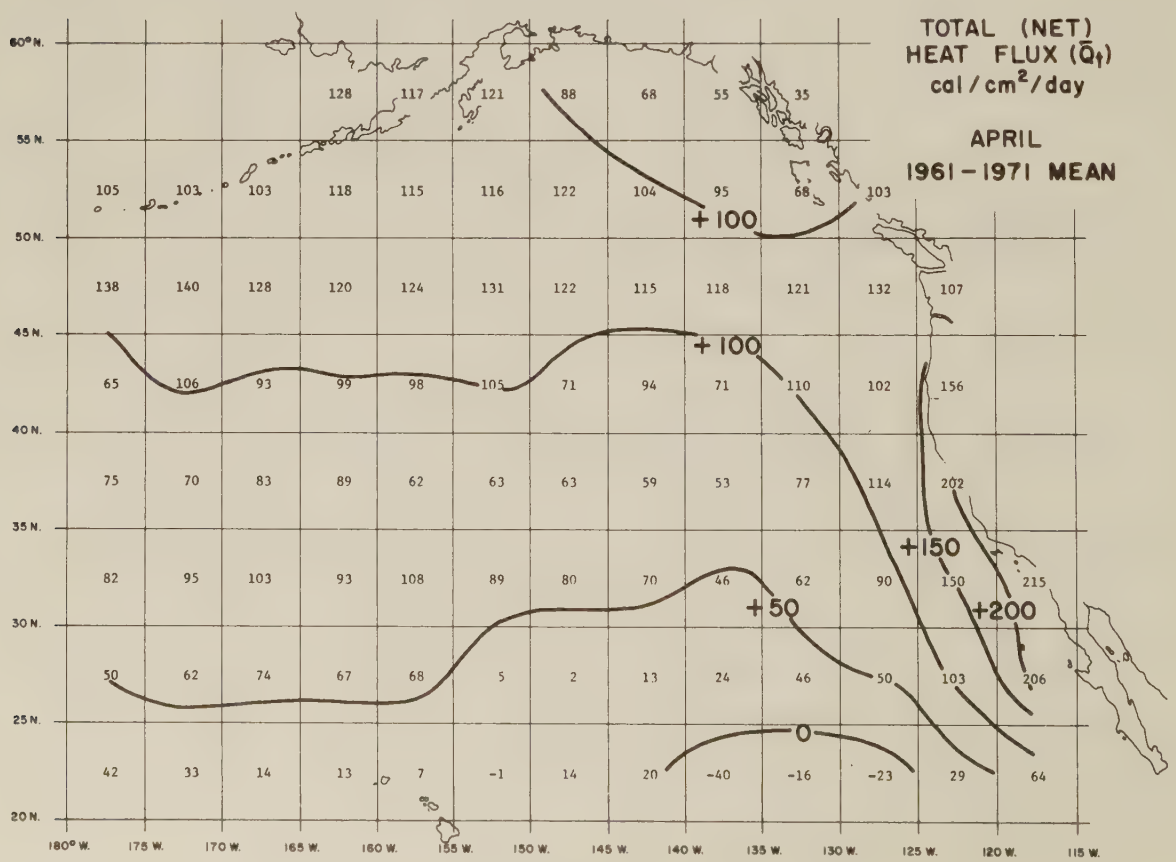

TOTAL (NET)
HEAT FLUX (Q_t)
cal / cm^2 / day
DECEMBER 1971
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
-300
-200
-100
0
+100

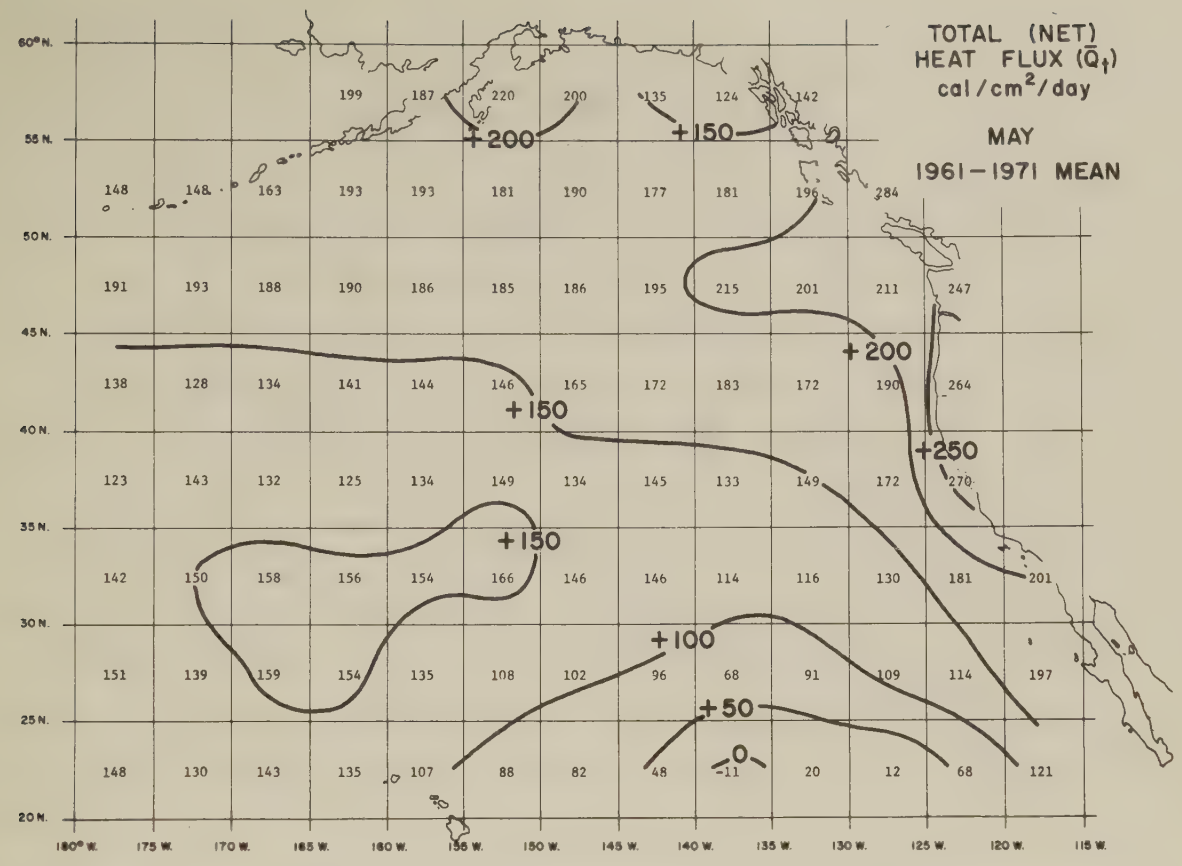
PART 2. TOTAL (NET) HEAT FLUX 1961-71 MEAN MONTHLY VALUES (NORMALS).

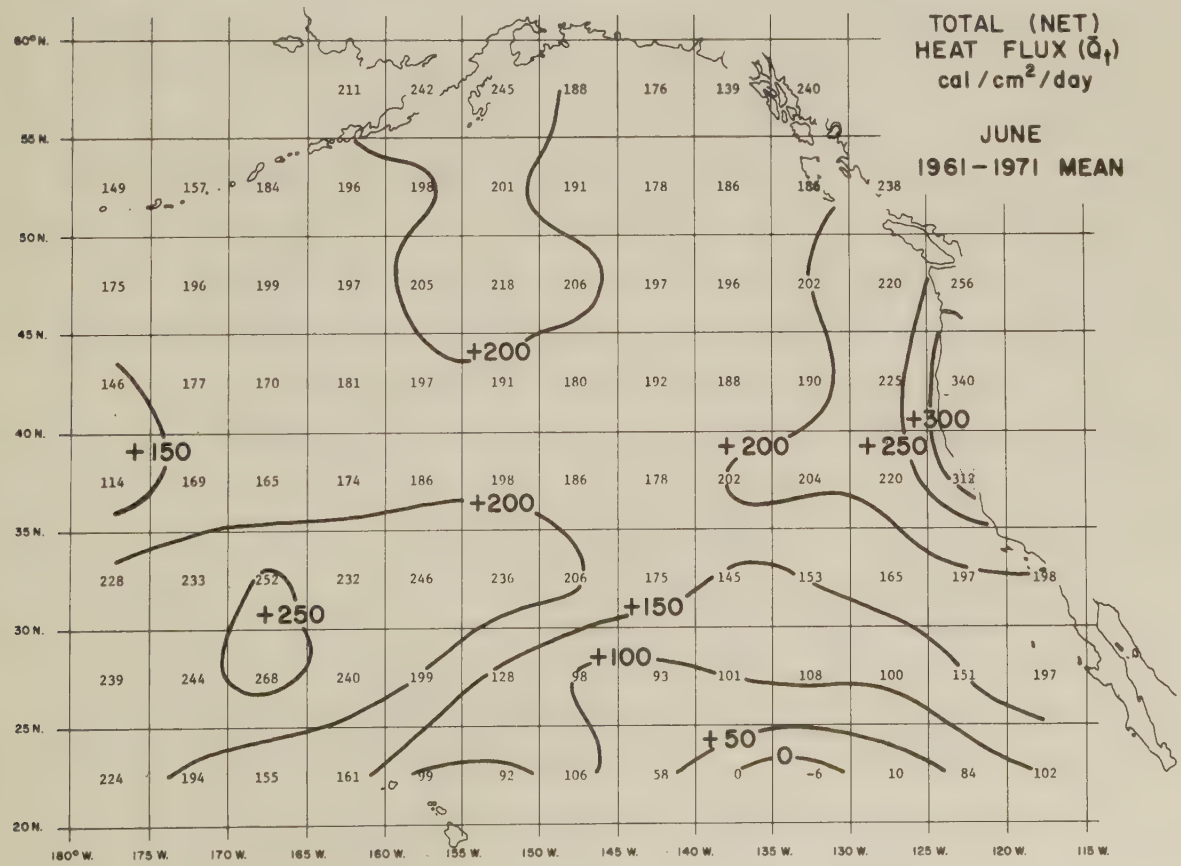


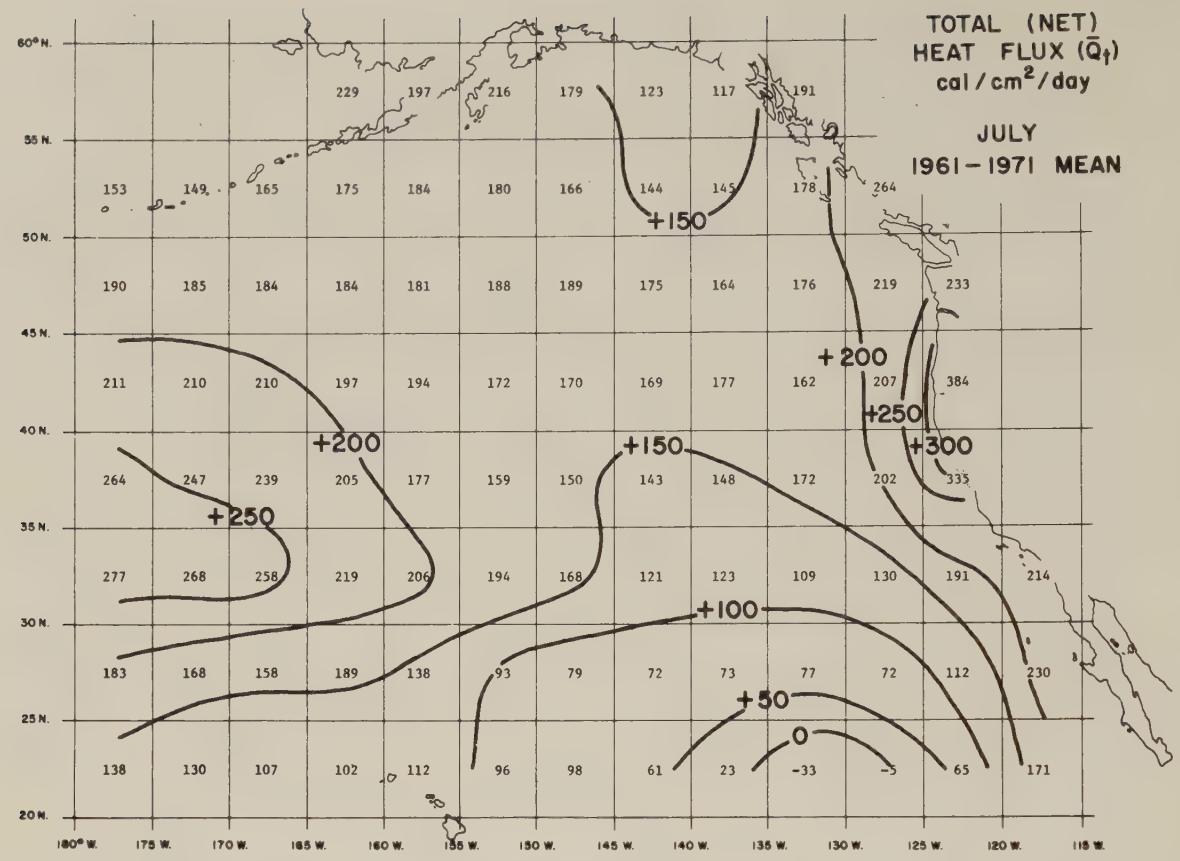


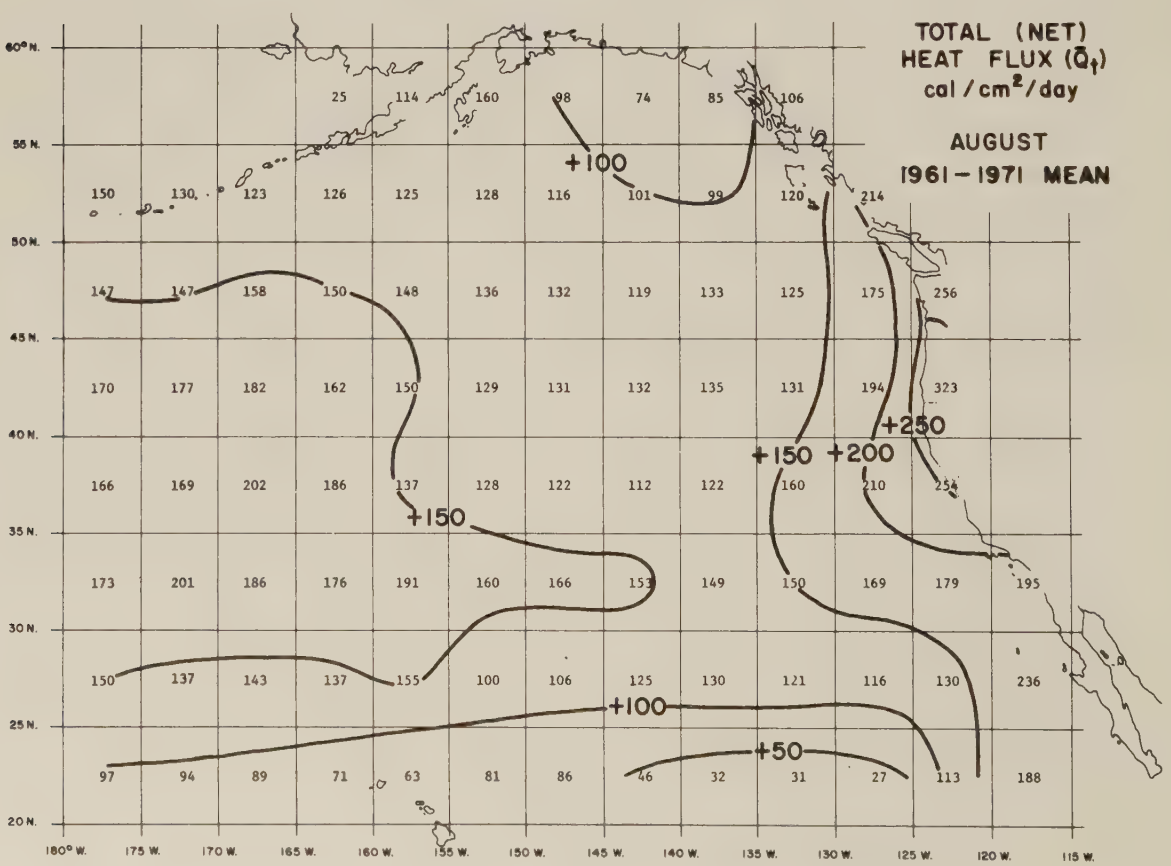

TOTAL (NET)
HEAT FLUX ($\bar{Q}_t$)
cal / cm^2 / day
MARCH
1961 – 1971 MEAN
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
85 -59 -1 -28 -49 -81 -113
13 18 0 -2 20 21 19 -5 -14 -36 -150
41 46 39 45 33 20 26 28 16 8 3 16
-26 -3 10 16 2 1 4 -10 -15 -17 22 54
-49 -49 -15 -12 -10 -1 -21 -14 -6 3 35 114
15 20 31 -1 10 14 -8 -10 -18 -4 35 94 129
-5 -21 -20 -44 -50 -23 -44 -32 -12 0 -1 23 159
-19 -13 -26 -15 0 -39 -16 -34 -36 -47 -24 43 91
-50
0
0
0
0
+50
+100

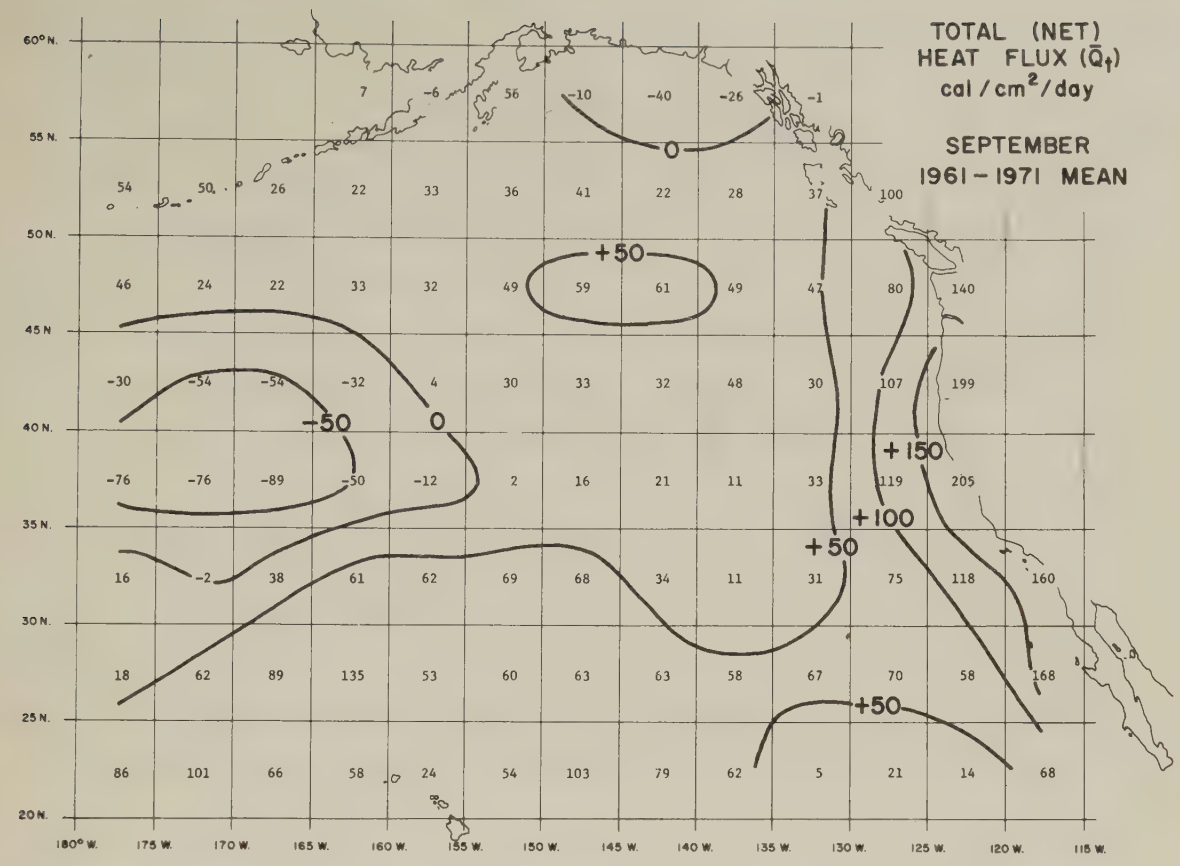

TOTAL (NET)
HEAT FLUX ($\bar{Q}_t$)
cal / cm^2 / day
APRIL
1961 – 1971 MEAN
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
128 117 121 88 68 55 35
105 103 103 118 115 116 122 104 95 68 103
138 140 128 120 124 131 122 115 118 121 132 107
65 106 93 99 98 105 71 94 71 110 102 156
75 70 83 89 62 63 63 59 53 77 114 202
82 95 103 93 108 89 80 70 46 62 90 150 215
50 62 74 67 68 5 2 13 24 46 50 103 206
42 33 14 13 7 -1 14 20 -40 -16 -23 29 64
+100
+100
+150
+50
+200
0

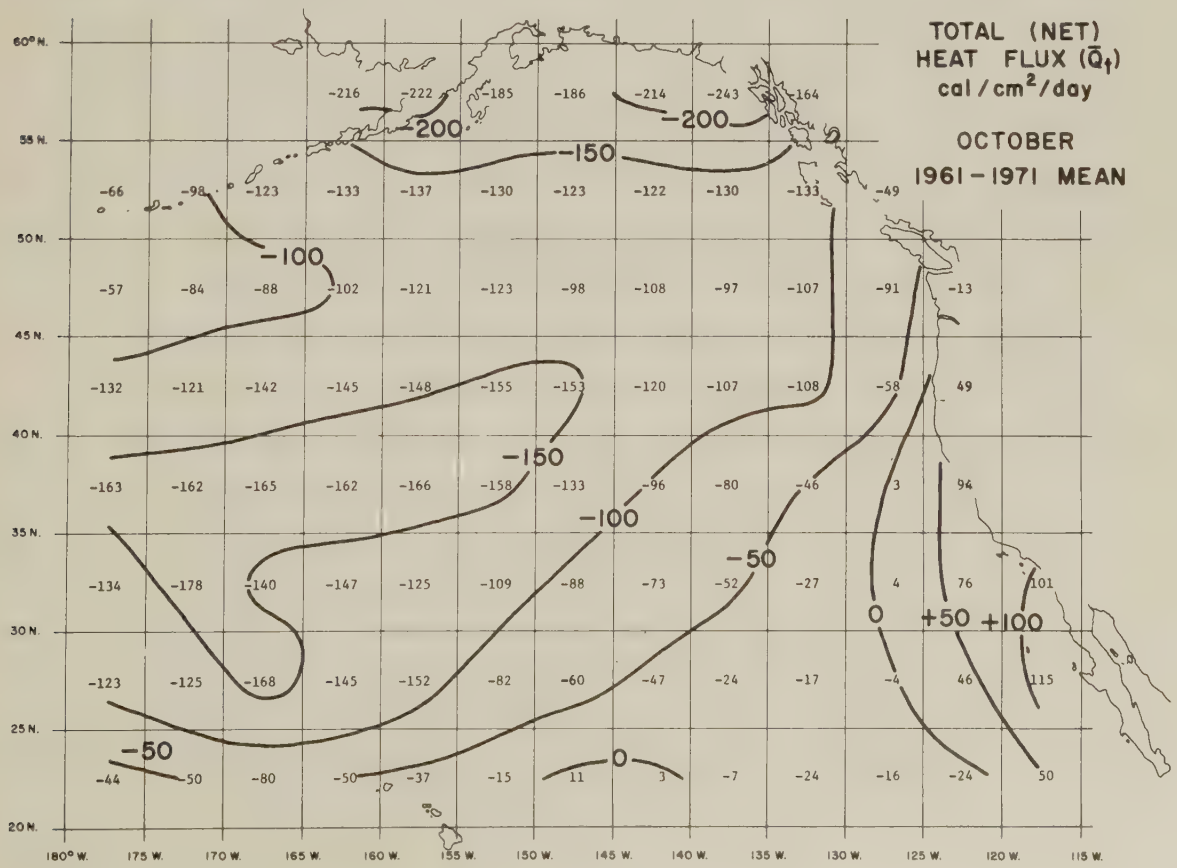

TOTAL (NET)
HEAT FLUX ($\bar{Q}_t$)
cal / cm² / day
MAY
1961 – 1971 MEAN
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+200
+150
+150
+200
+250
+150
+100
+50
0

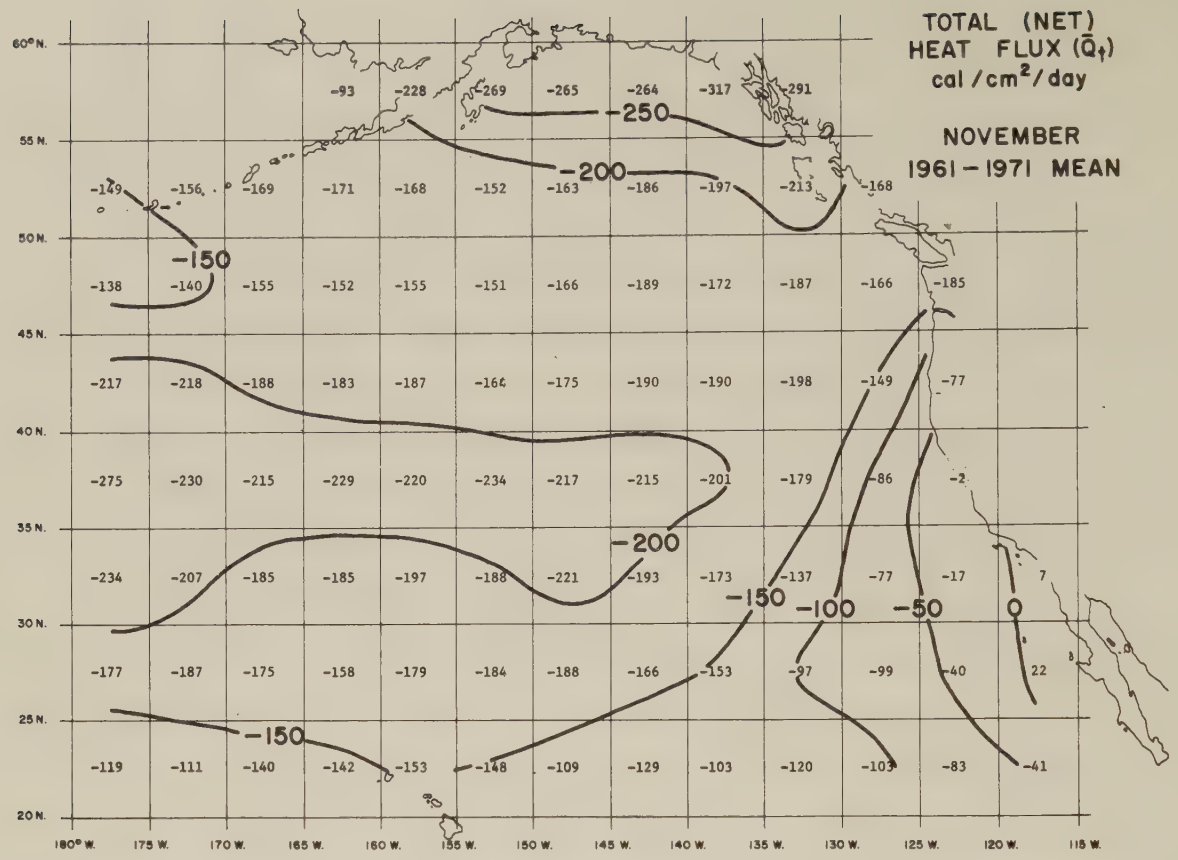

TOTAL (NET)
HEAT FLUX ($\bar{Q}_t$)
cal / cm² / day
JUNE
1961 – 1971 MEAN
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+200
+150
+200
+250
+300
+200
+250
+150
+100
+50
0

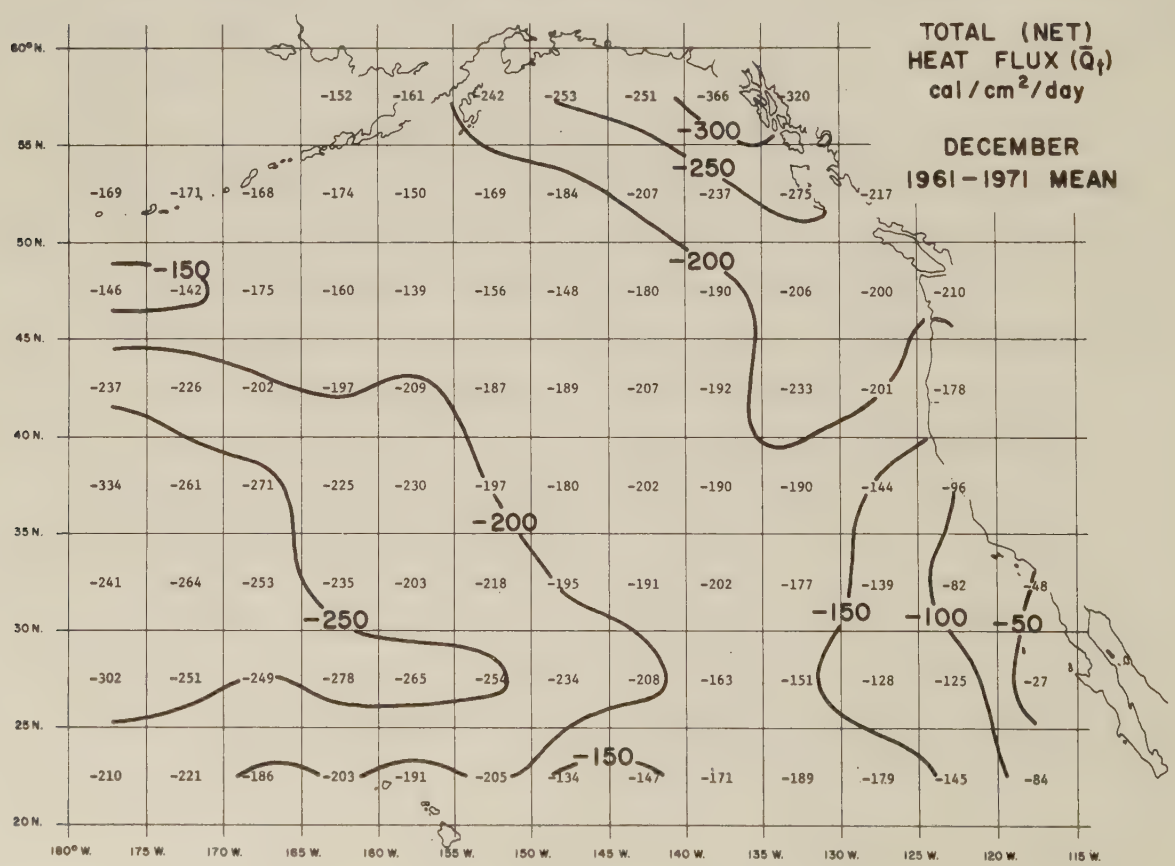

TOTAL (NET)
HEAT FLUX ($\bar{Q}_t$)
cal / cm^2 / day
JULY
1961 – 1971 MEAN
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
229 197 216 179 123 117 191
153 149 165 175 184 180 166 144 145 178 264
190 185 184 184 181 188 189 175 164 176 219 233
211 210 210 197 194 172 170 169 177 162 207 384
264 247 239 205 177 159 150 143 148 172 202 335
277 268 258 219 206 194 168 121 123 109 130 191 214
183 168 158 189 138 93 79 72 73 77 72 112 230
138 130 107 102 112 96 98 61 23 -33 -5 65 171
+150
+200
+250
+300
+200
+250
+150
+100
+50
0


TOTAL (NET)
HEAT FLUX ($\bar{Q}_t$)
cal / cm^2 / day
AUGUST
1961 – 1971 MEAN
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
25 114 160 98 74 85 106
150 130 123 126 125 128 116 101 99 120 214
147 147 158 150 148 136 132 119 133 125 175 256
170 177 182 162 150 129 131 132 135 131 194 323
166 169 202 186 137 128 122 112 122 160 210 254
173 201 186 176 191 160 166 153 149 150 169 179 195
150 137 143 137 155 100 106 125 130 121 116 130 236
97 94 89 71 63 81 86 46 32 31 27 113 188
+100
+150
+150
+200
+250
+100
+50

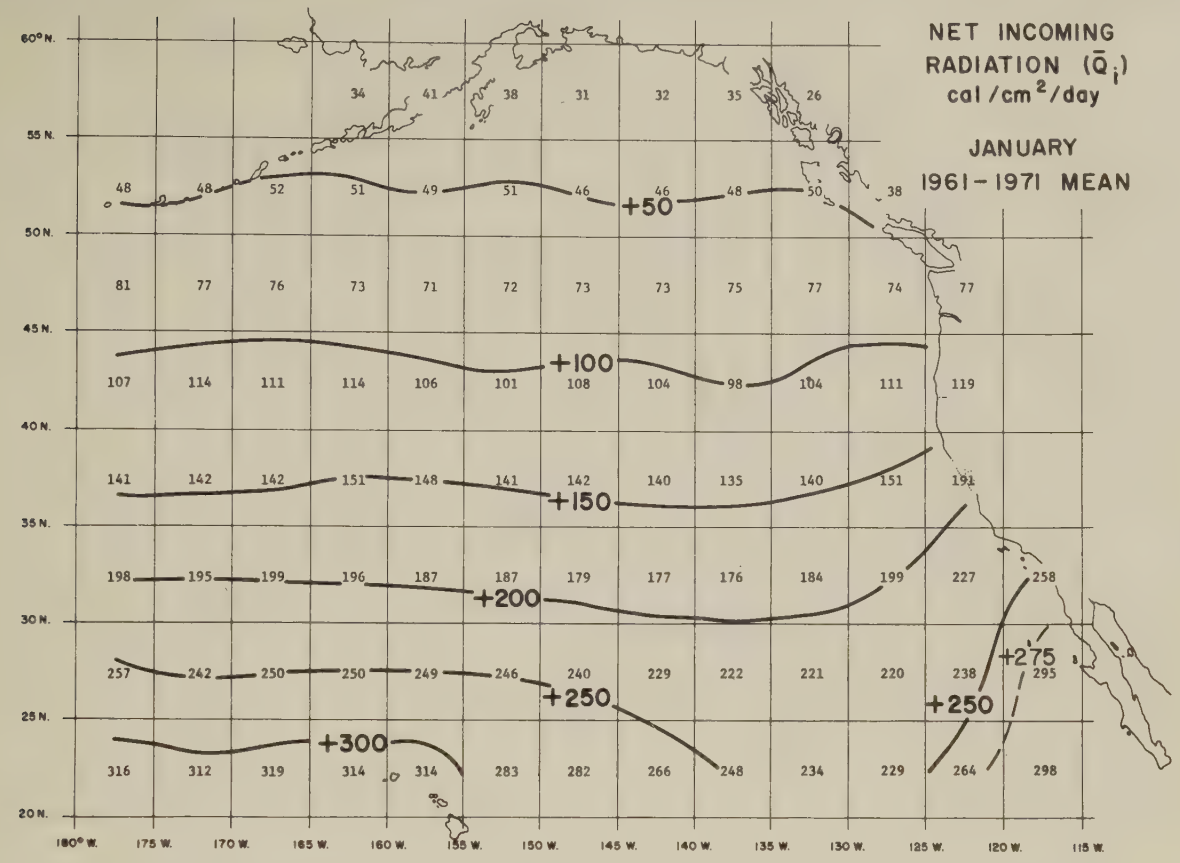

TOTAL (NET)
HEAT FLUX ($\bar{Q}_t$)
cal / cm^2 / day
SEPTEMBER
1961 – 1971 MEAN
60° N.
55 N.
50 N.
45 N
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+50
0
-50
+150
+100
+50
+50

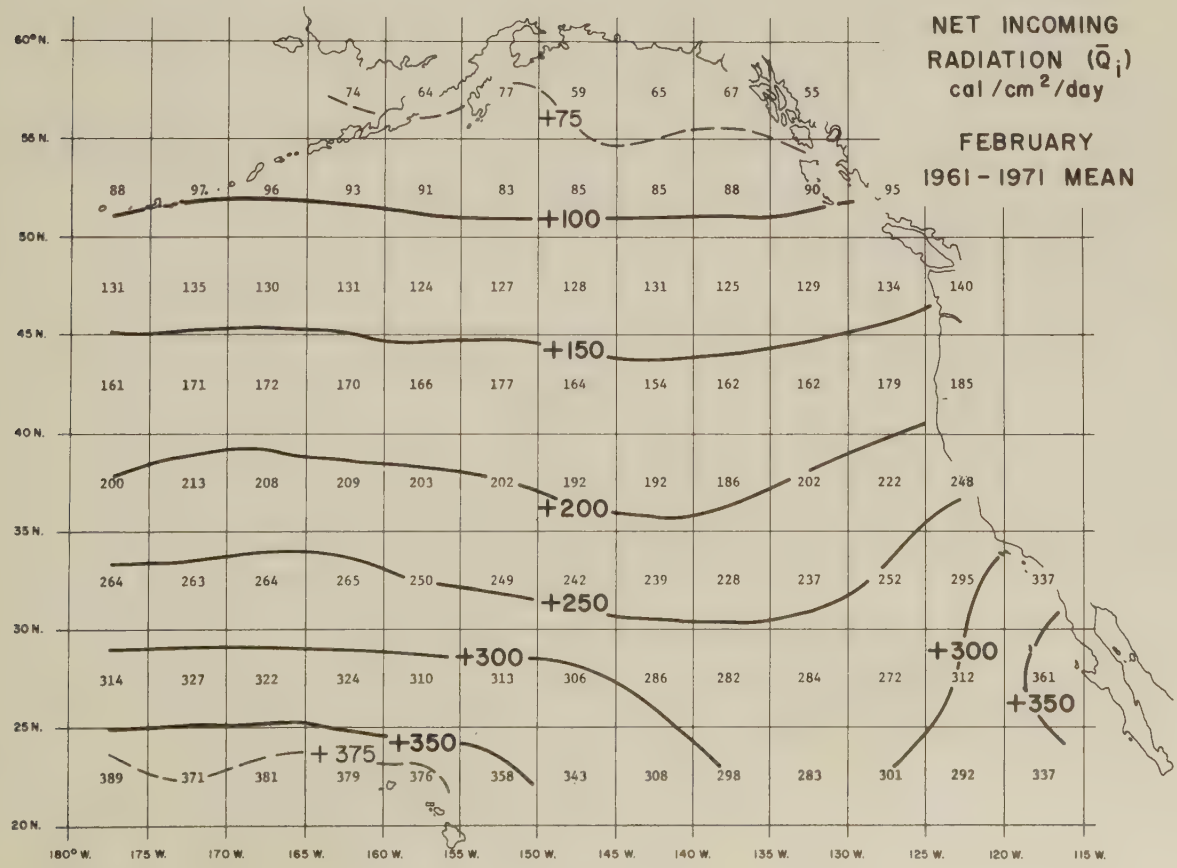

TOTAL (NET)
HEAT FLUX ($\bar{Q}_t$)
cal / cm^2 / day
OCTOBER
1961 – 1971 MEAN
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
-200
-200
-150
-100
-150
-100
-50
-50
0
0
+50
+100

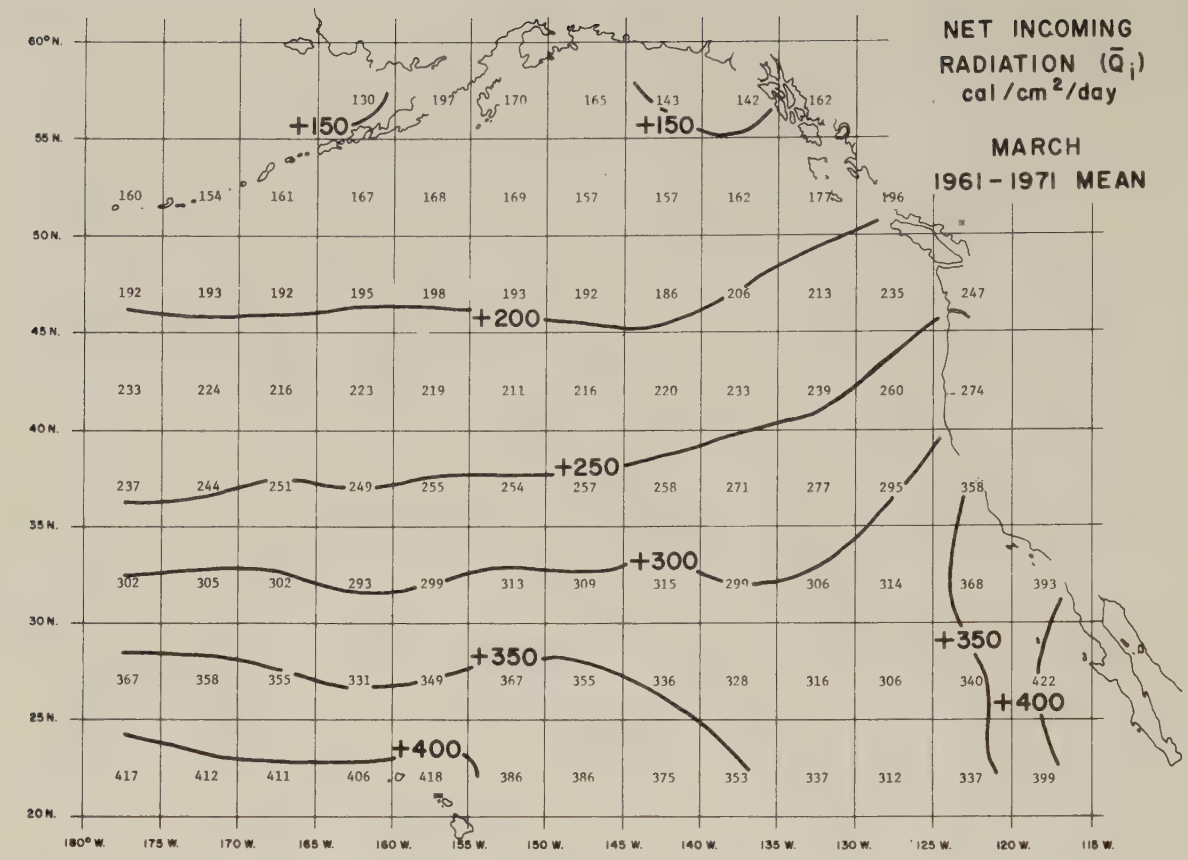

TOTAL (NET)
HEAT FLUX ($\bar{Q}_t$)
cal / cm² / day
NOVEMBER
1961 – 1971 MEAN
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
-93 -228 -269 -265 -264 -317 -291
-149 -156 -169 -171 -168 -152 -163 -186 -197 -213 -168
-138 -140 -155 -152 -155 -151 -166 -189 -172 -187 -166 -185
-217 -218 -188 -183 -187 -164 -175 -190 -190 -198 -149 -77
-275 -230 -215 -229 -220 -234 -217 -215 -201 -179 -86 -2
-234 -207 -185 -185 -197 -188 -221 -193 -173 -137 -77 -17 7
-177 -187 -175 -158 -179 -184 -188 -166 -153 -97 -99 -40 22
-119 -111 -140 -142 -153 -148 -109 -129 -103 -120 -103 -83 -41
-250
-200
-150
-200
-150
-100
-50
0
-150

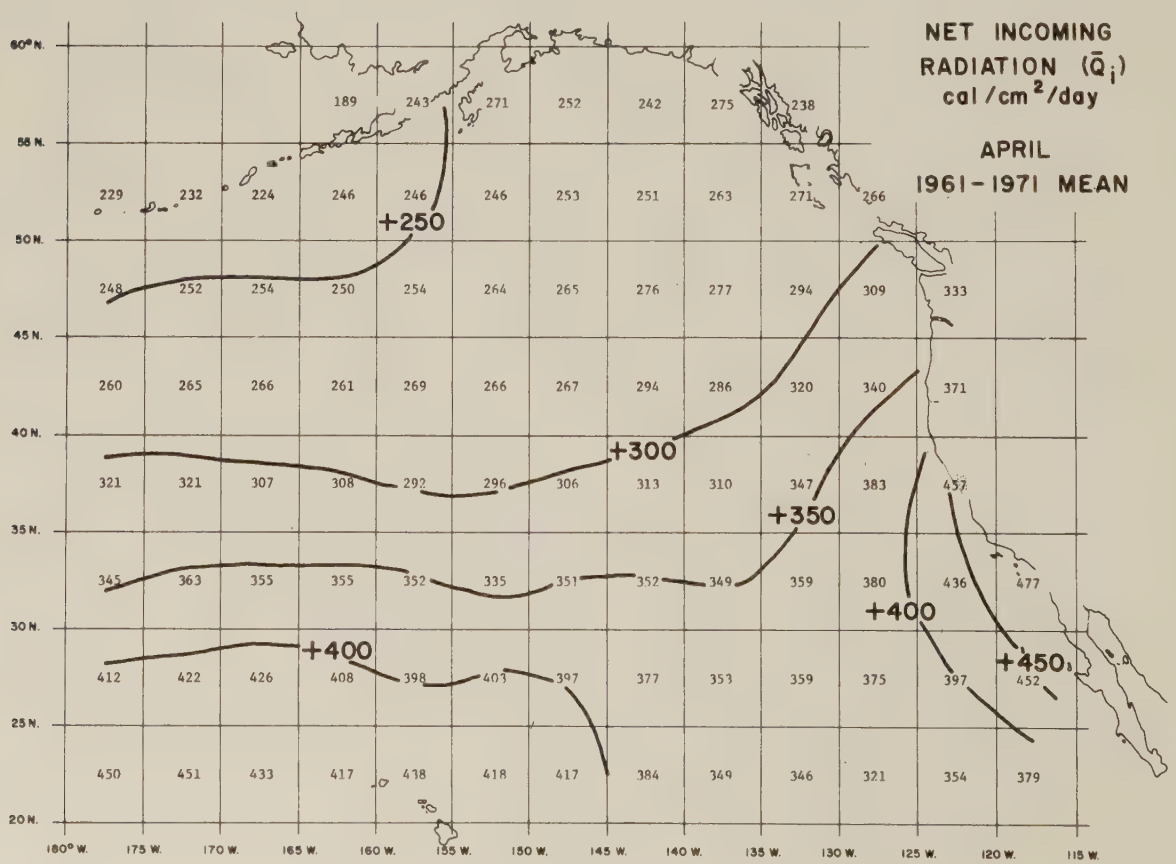

TOTAL (NET)
HEAT FLUX ($\bar{Q}_t$)
cal / cm² / day
DECEMBER
1961 – 1971 MEAN
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
-152 -161 -242 -253 -251 -366 -320
-169 -171 -168 -174 -150 -169 -184 -207 -237 -275 -217
-146 -142 -175 -160 -139 -156 -148 -180 -190 -206 -200 -210
-237 -226 -202 -197 -209 -187 -189 -207 -192 -233 -201 -178
-334 -261 -271 -225 -230 -197 -180 -202 -190 -190 -144 -96
-241 -264 -253 -235 -203 -218 -195 -191 -202 -177 -139 -82 -48
-302 -251 -249 -278 -265 -254 -234 -208 -163 -151 -128 -125 -27
-210 -221 -186 -203 -191 -205 -134 -147 -171 -189 -179 -145 -84
-300
-250
-150
-200
-200
-250
-150
-150
-100
-50

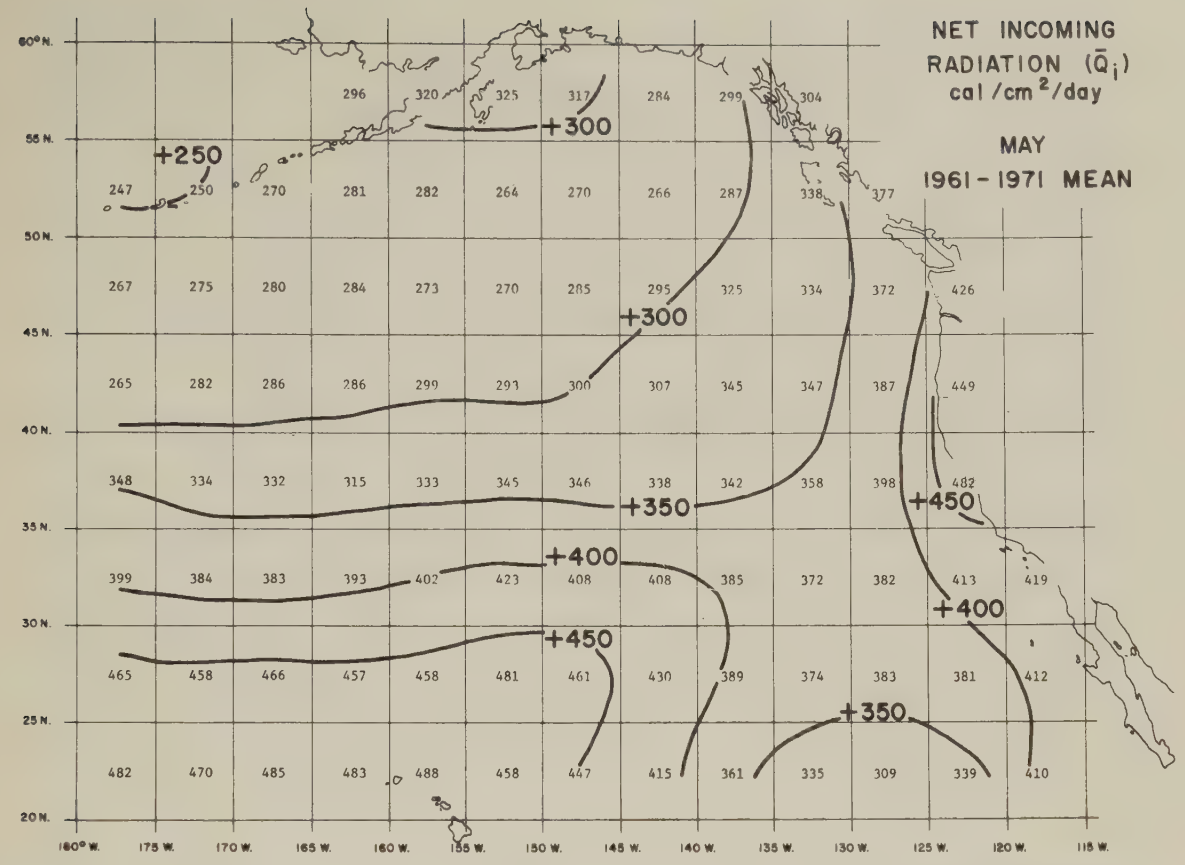
PART 3. NET INCOMING RADIATION 1961-71 MEAN MONTHLY VALUES (NORMALS).

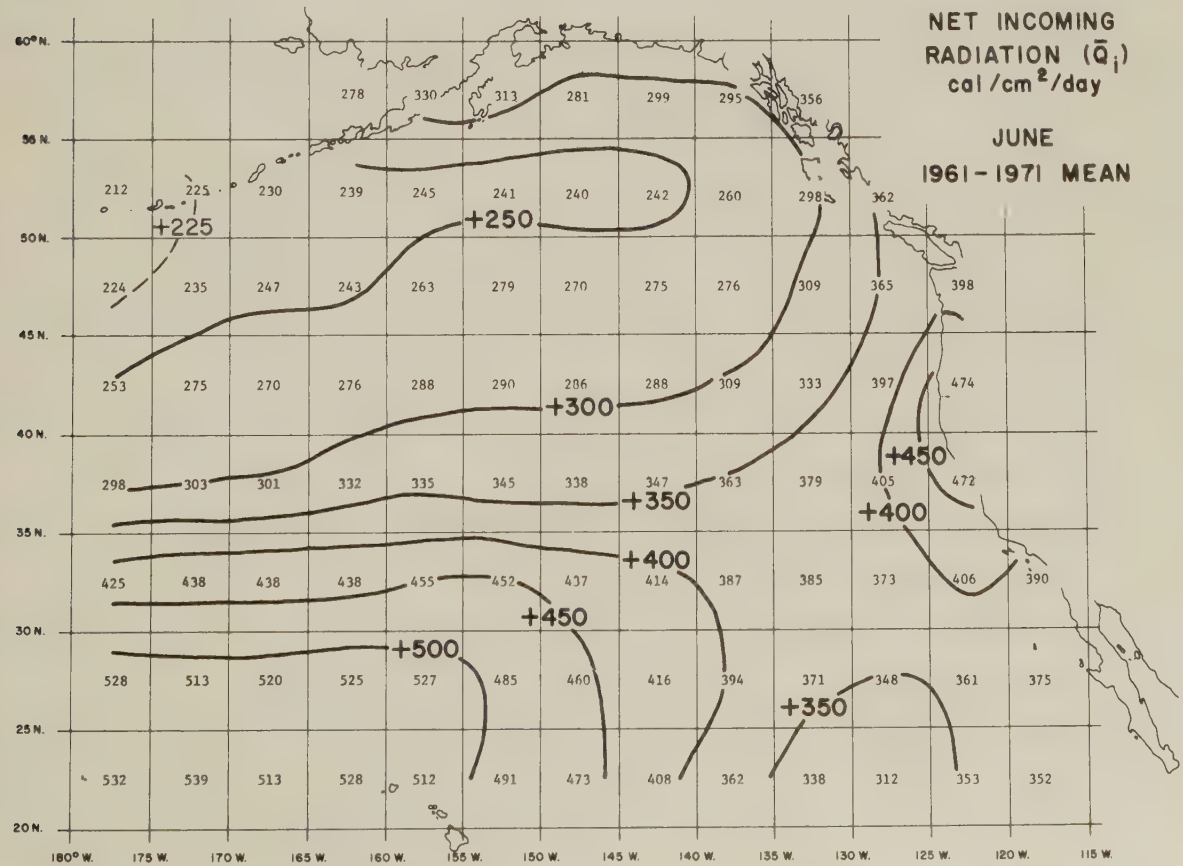


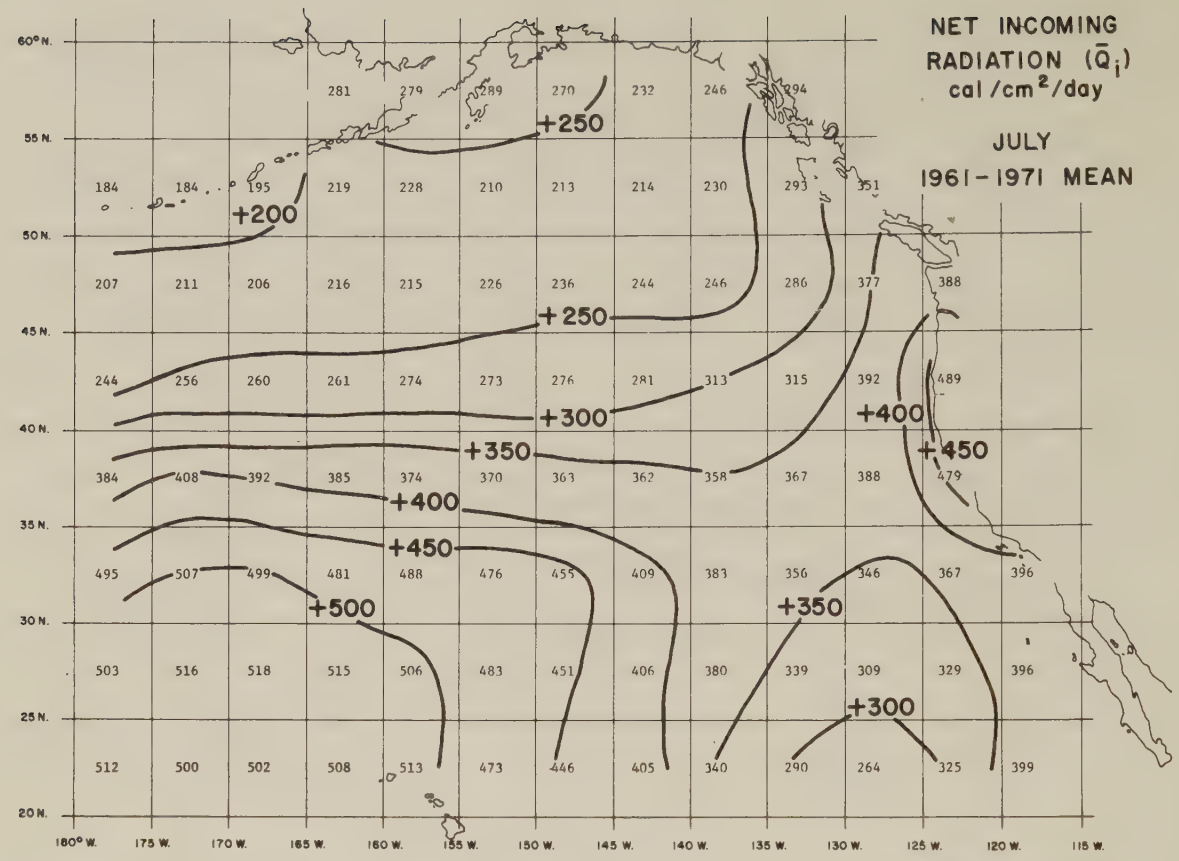


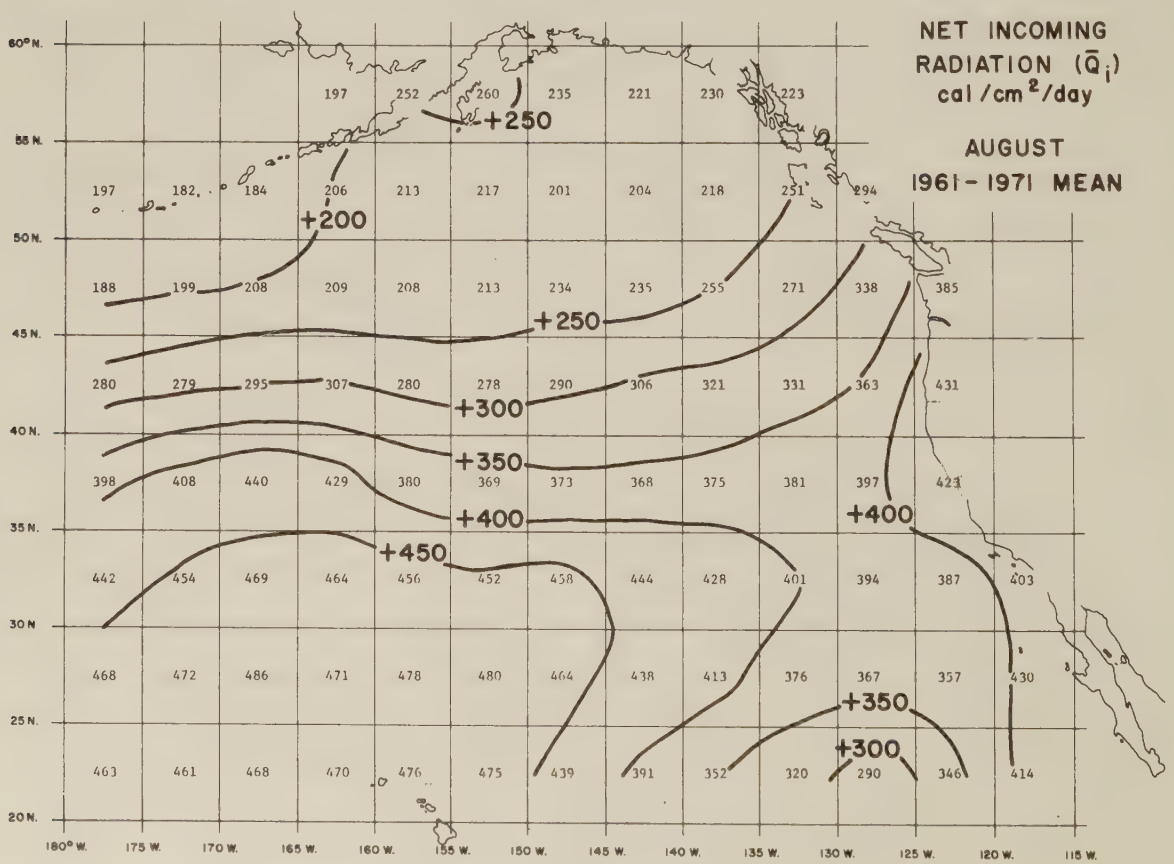

NET INCOMING
RADIATION ($\bar{Q}_i$)
cal/cm^2/day
MARCH
1961 - 1971 MEAN
60°N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+150
+150
+200
+250
+300
+350
+350
+400
+400

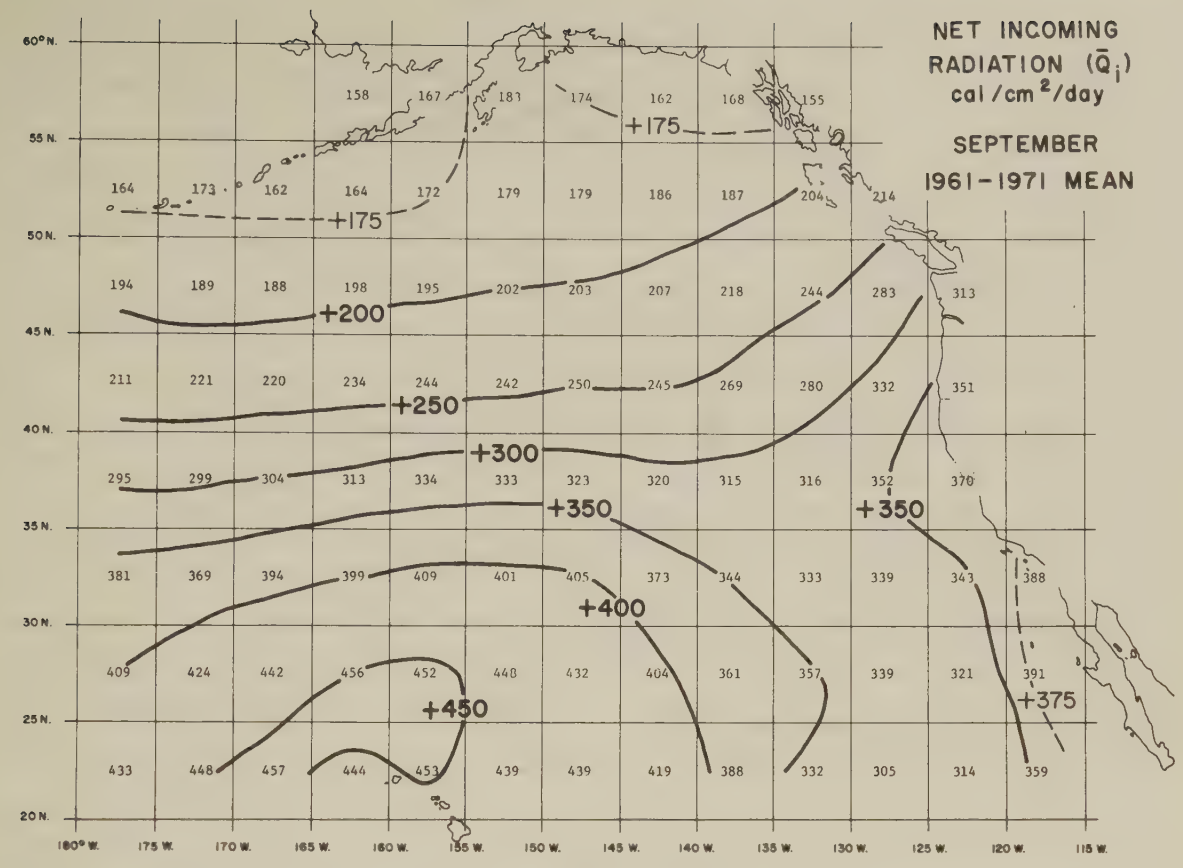

NET INCOMING
RADIATION ($\bar{Q}_i$)
cal/cm^2/day
APRIL
1961 - 1971 MEAN
60°N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+250
+300
+350
+400
+400
+450

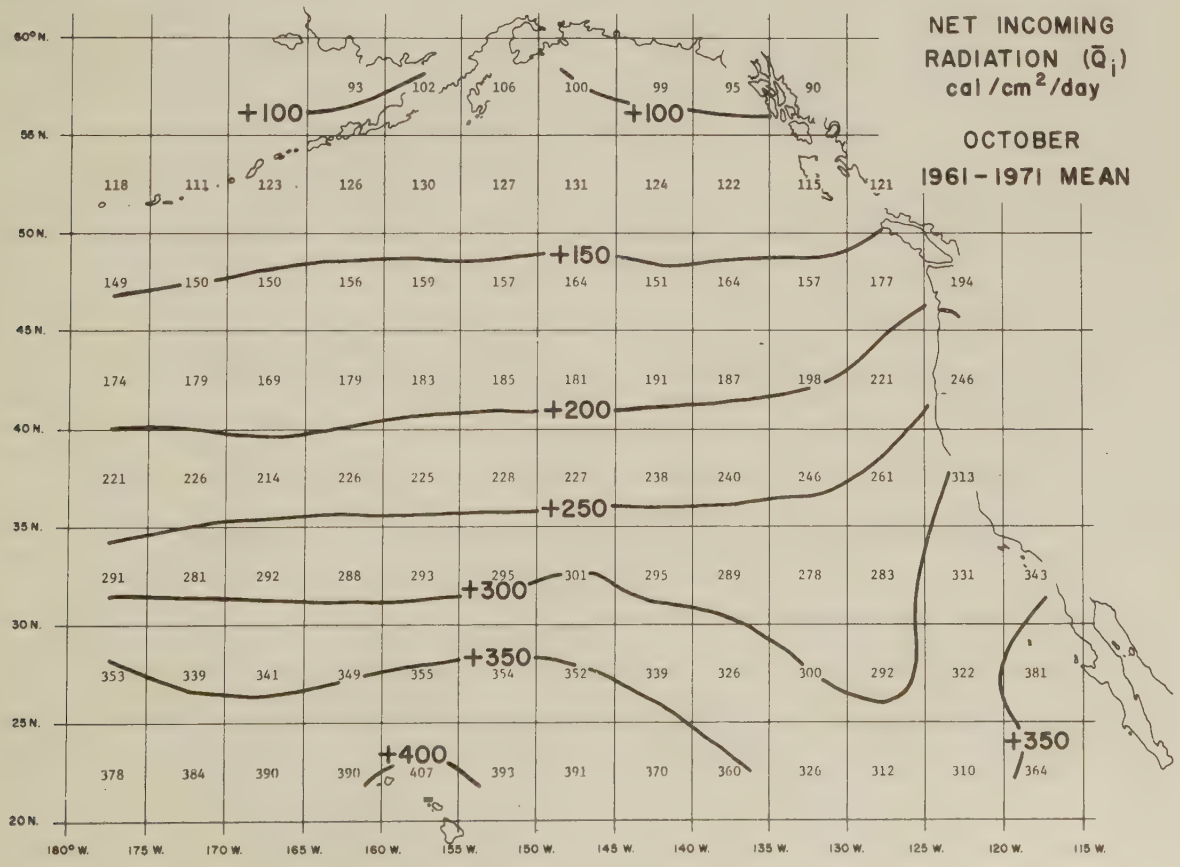

NET INCOMING
RADIATION ($\bar{Q}_i$)
cal/cm²/day
MAY
1961 - 1971 MEAN
60°N.
55 N.
50N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
160° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+250
+300
+300
+350
+400
+450
+400
+350
296 320 325 317 284 299 304
247 250 270 281 282 264 270 266 287 338 377
267 275 280 284 273 270 285 295 325 334 372 426
265 282 286 286 299 293 300 307 345 347 387 449
348 334 332 315 333 345 346 338 342 358 398 482
399 384 383 393 402 423 408 408 385 372 382 413 419
465 458 466 457 458 481 461 430 389 374 383 381 412
482 470 485 483 488 458 447 415 361 335 309 339 410

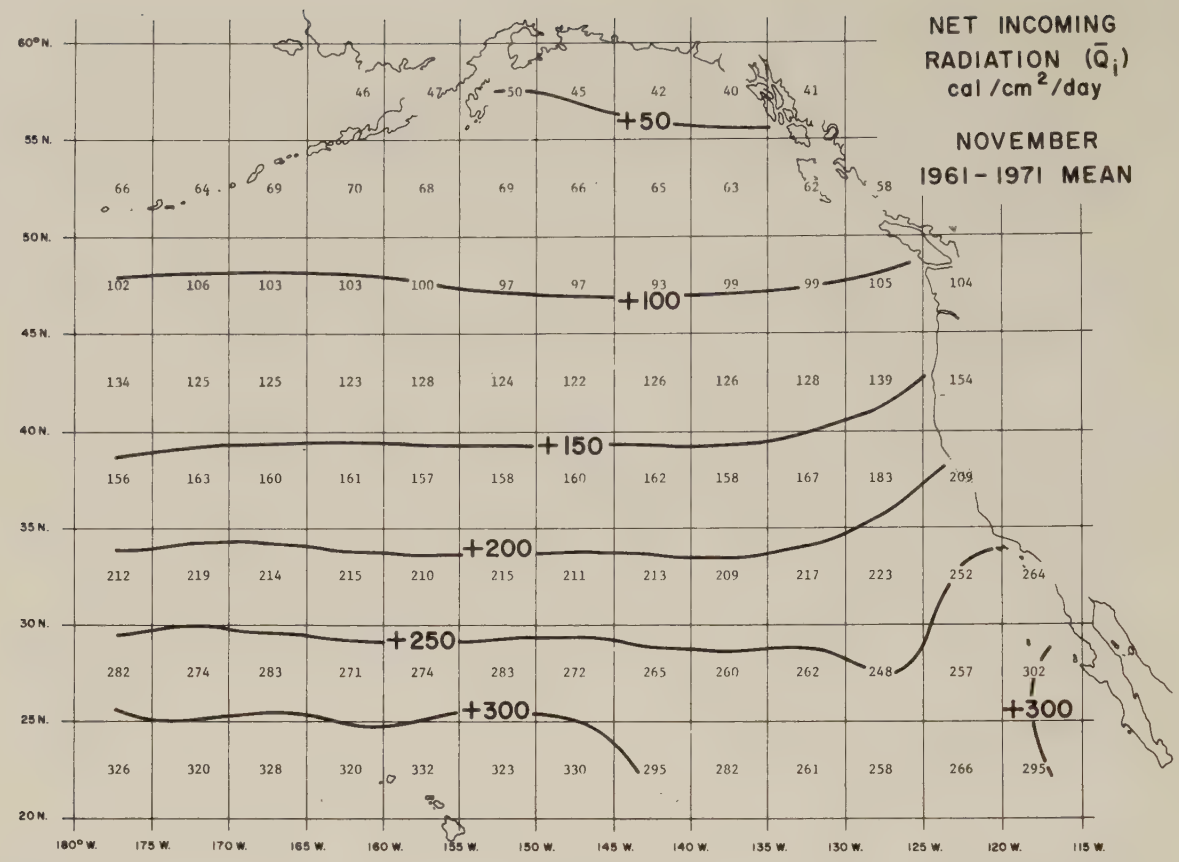

NET INCOMING
RADIATION ($\bar{Q}_i$)
cal/cm²/day
JUNE
1961 - 1971 MEAN
60°N.
55 N.
50N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+225
+250
+300
+350
+400
+450
+500
+450
+400
+350
278 330 313 281 299 295 356
212 225 230 239 245 241 240 242 260 298 362
224 235 247 243 263 279 270 275 276 309 365 398
253 275 270 276 288 290 286 288 309 333 397 474
298 303 301 332 335 345 338 347 363 379 405 472
425 438 438 438 455 452 437 414 387 385 373 406 390
528 513 520 525 527 485 460 416 394 371 348 361 375
532 539 513 528 512 491 473 408 362 338 312 353 352

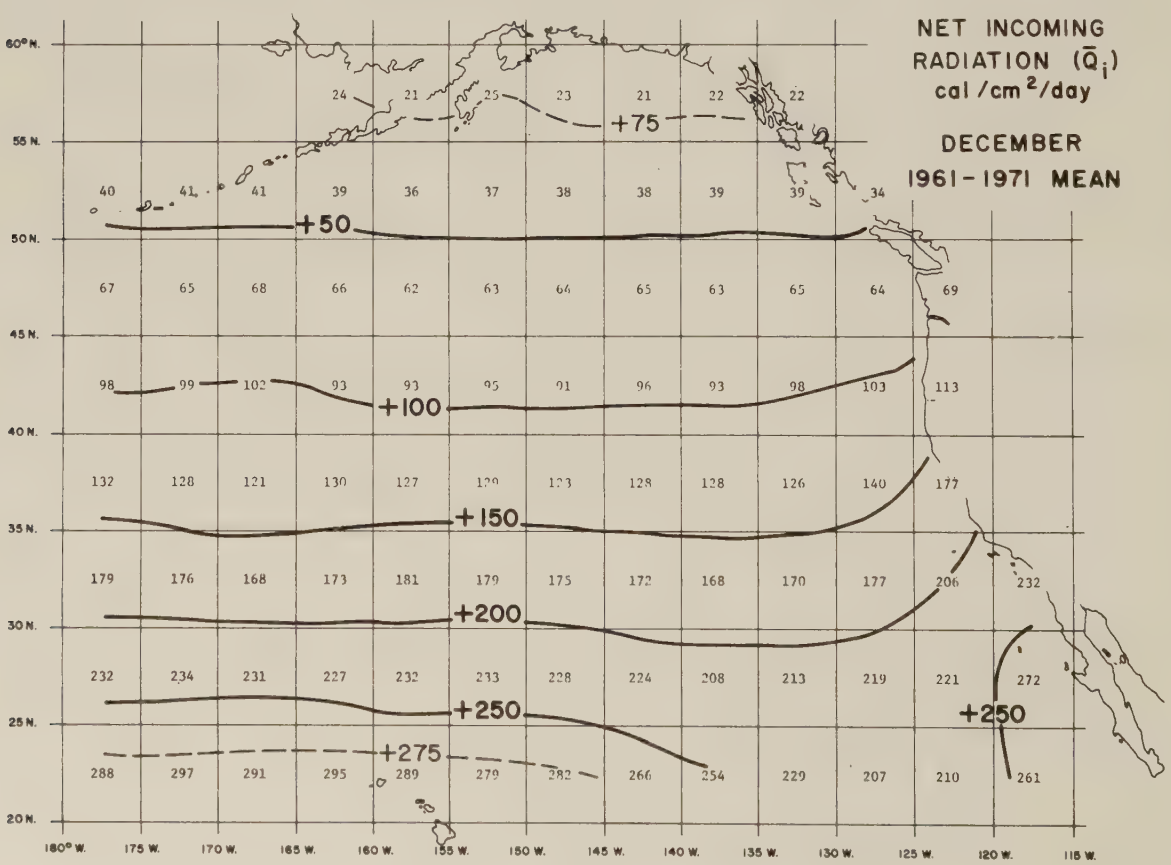

NET INCOMING
RADIATION ($\bar{Q}_i$)
cal /cm^2/day
JULY
1961 - 1971 MEAN
60°N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+200
+250
+300
+350
+400
+450
+500


NET INCOMING
RADIATION ($\bar{Q}_i$)
cal /cm^2/day
AUGUST
1961 - 1971 MEAN
60°N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+200
+250
+300
+350
+400
+450

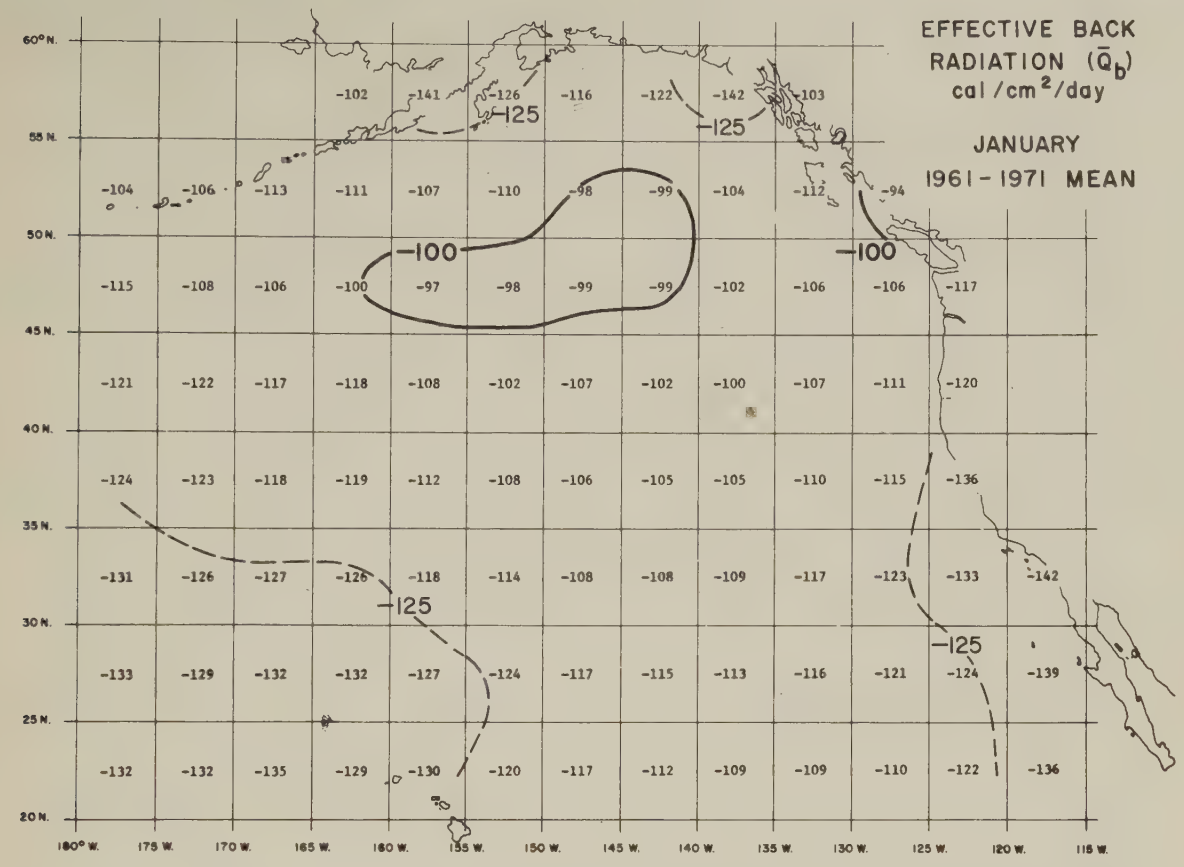

NET INCOMING
RADIATION ($\bar{Q}_i$)
cal/cm²/day
SEPTEMBER
1961-1971 MEAN
60°N.
55 N.
50N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+175
+200
+250
+300
+350
+400
+450
+375

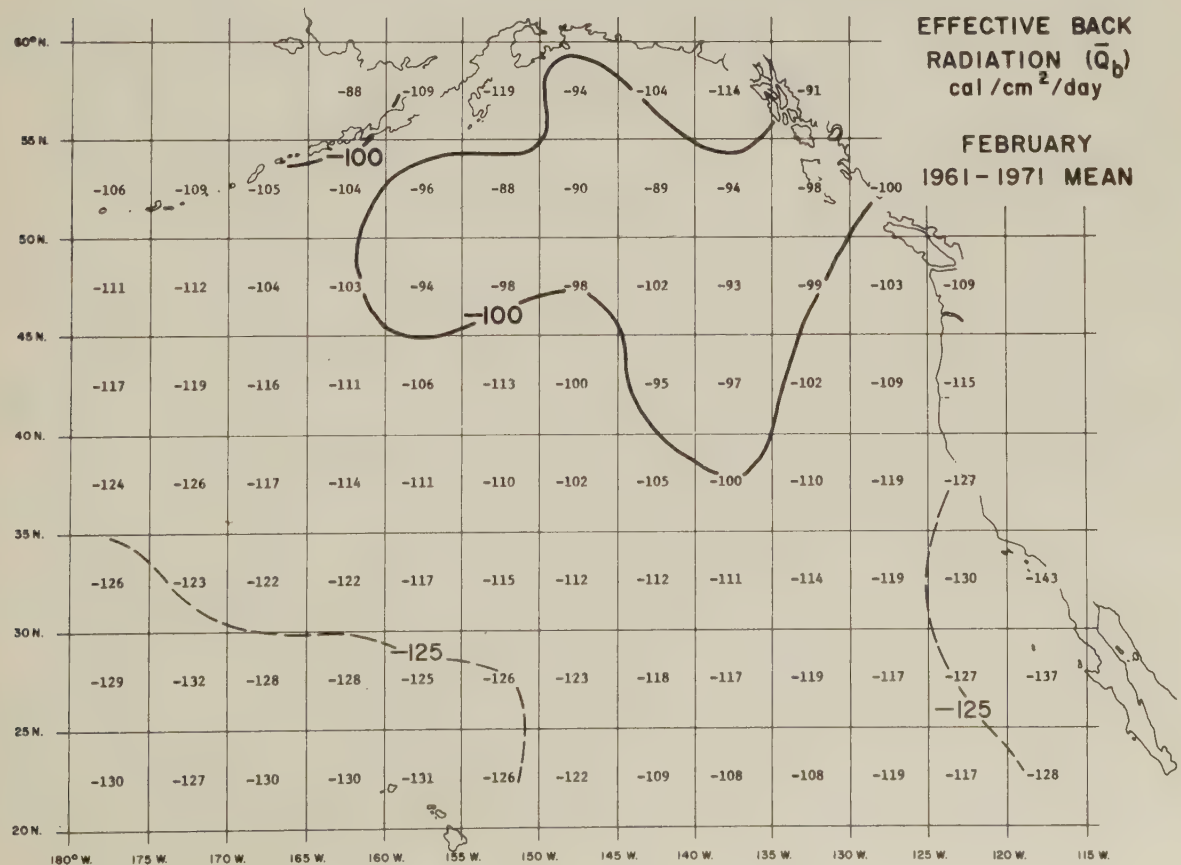

NET INCOMING
RADIATION ($\bar{Q}_i$)
cal/cm²/day
OCTOBER
1961-1971 MEAN
60°N.
55 N.
50N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+100
+100
+150
+200
+250
+300
+350
+400
+350

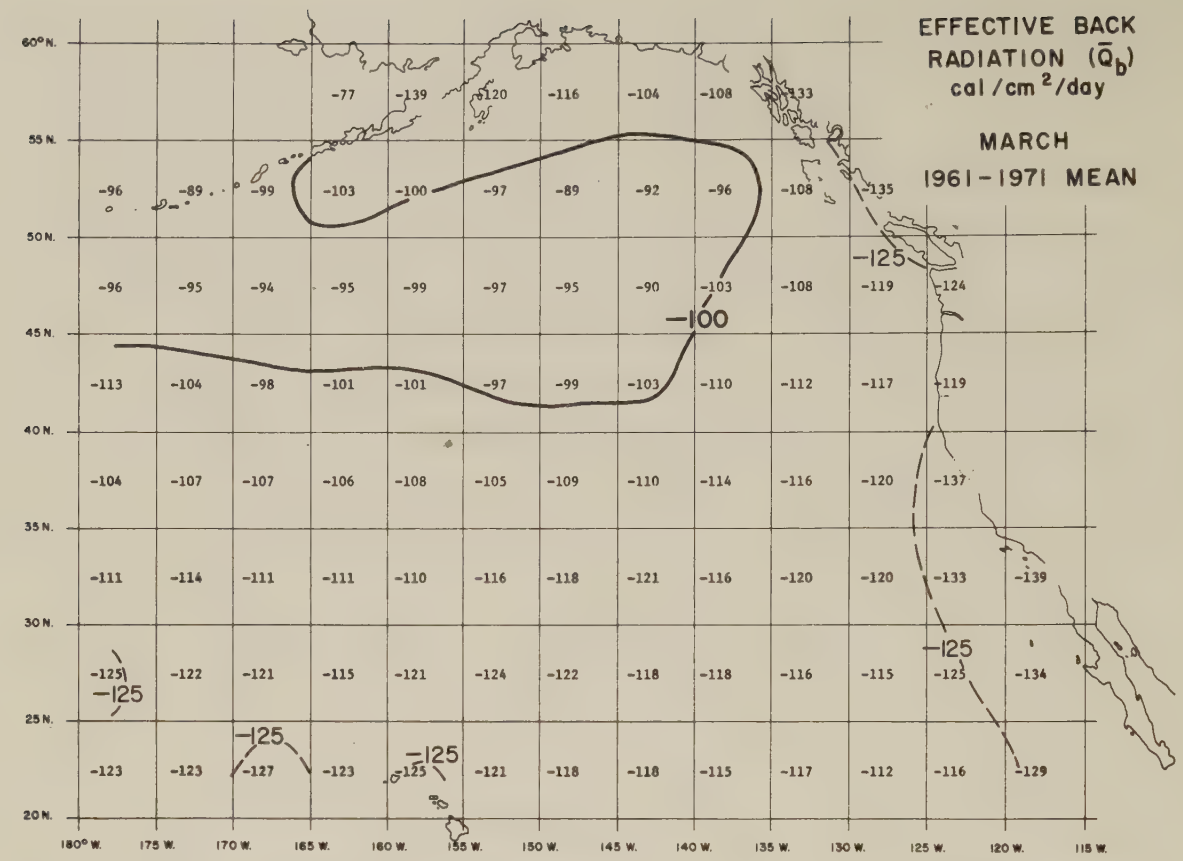

NET INCOMING RADIATION ($\bar{Q}_i$) cal /cm^2/day
NOVEMBER
1961 - 1971 MEAN
+50
+100
+150
+200
+250
+300
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.

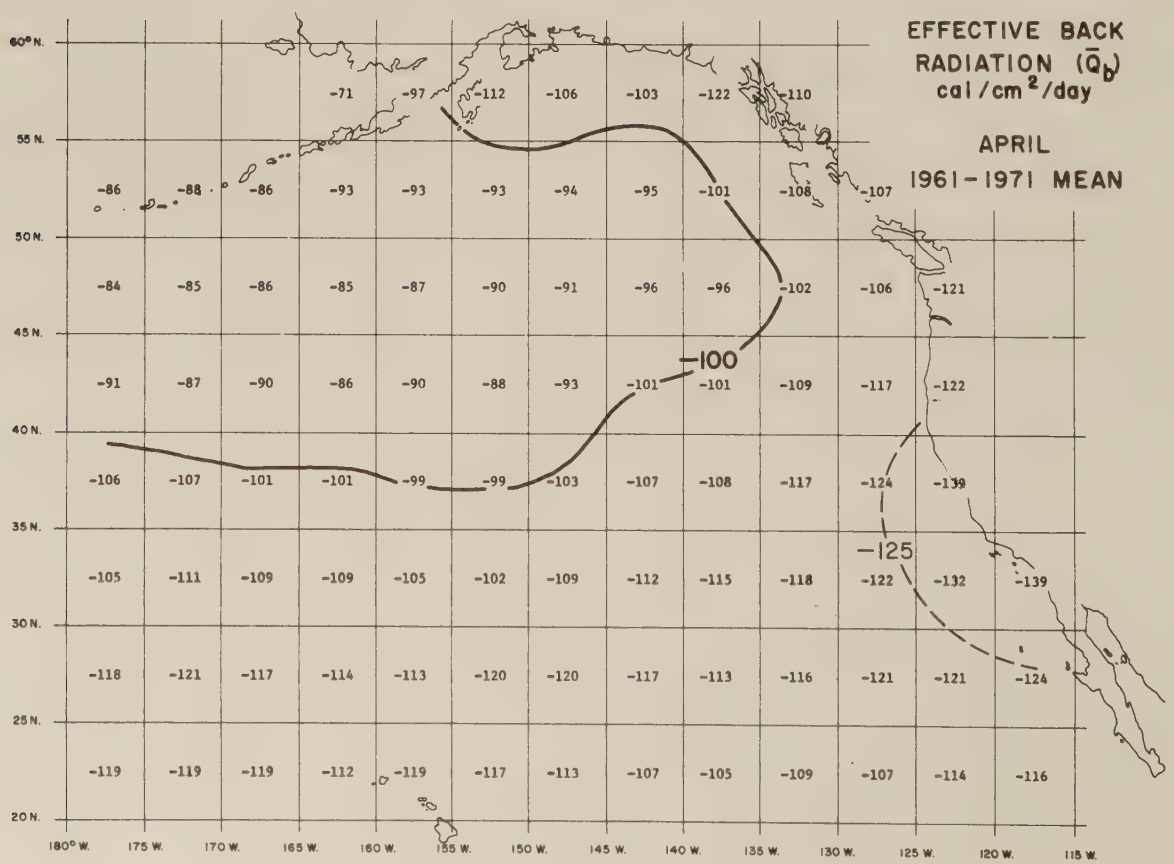

NET INCOMING RADIATION ($\bar{Q}_i$) cal /cm^2/day
DECEMBER
1961 - 1971 MEAN
+75
+50
+100
+150
+200
+250
+275
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.

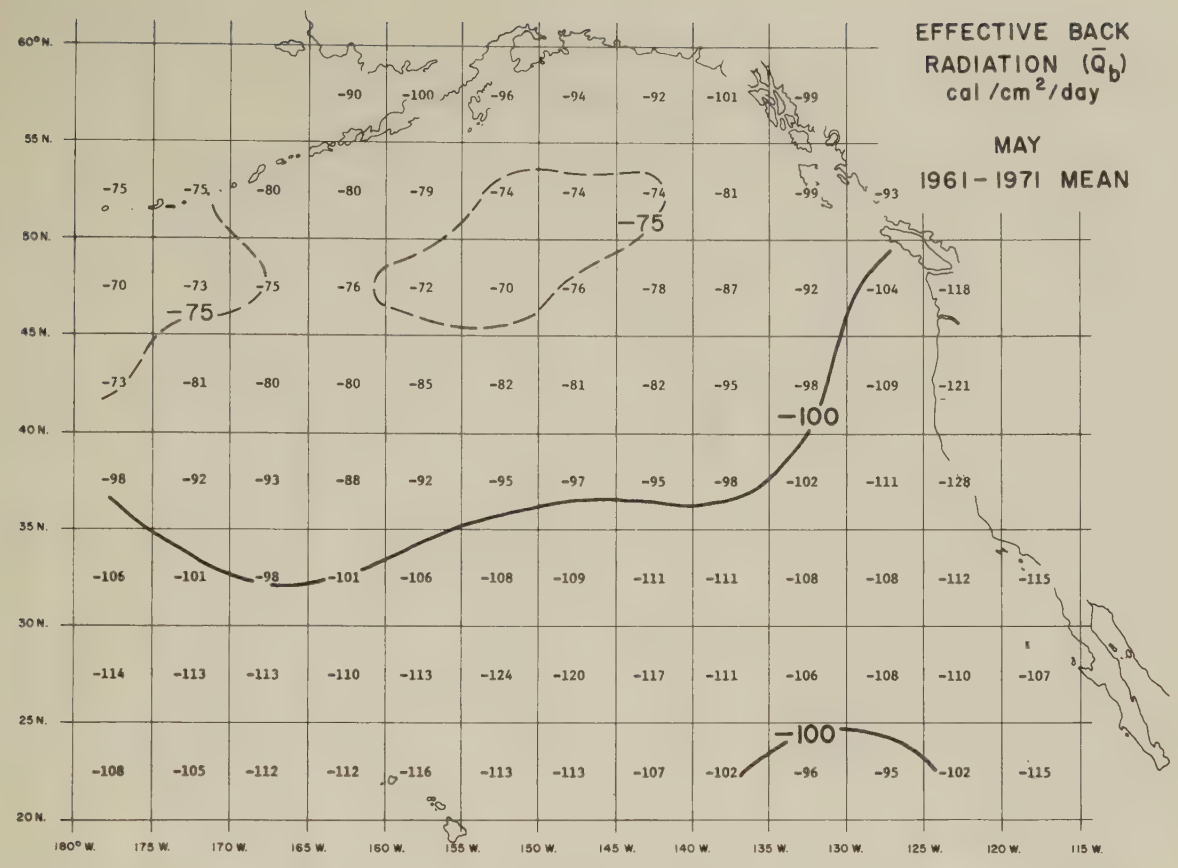
PART 4. EFFECTIVE BACK RADIATION 1961-71 MEAN MONTHLY VALUES (NORMALS).

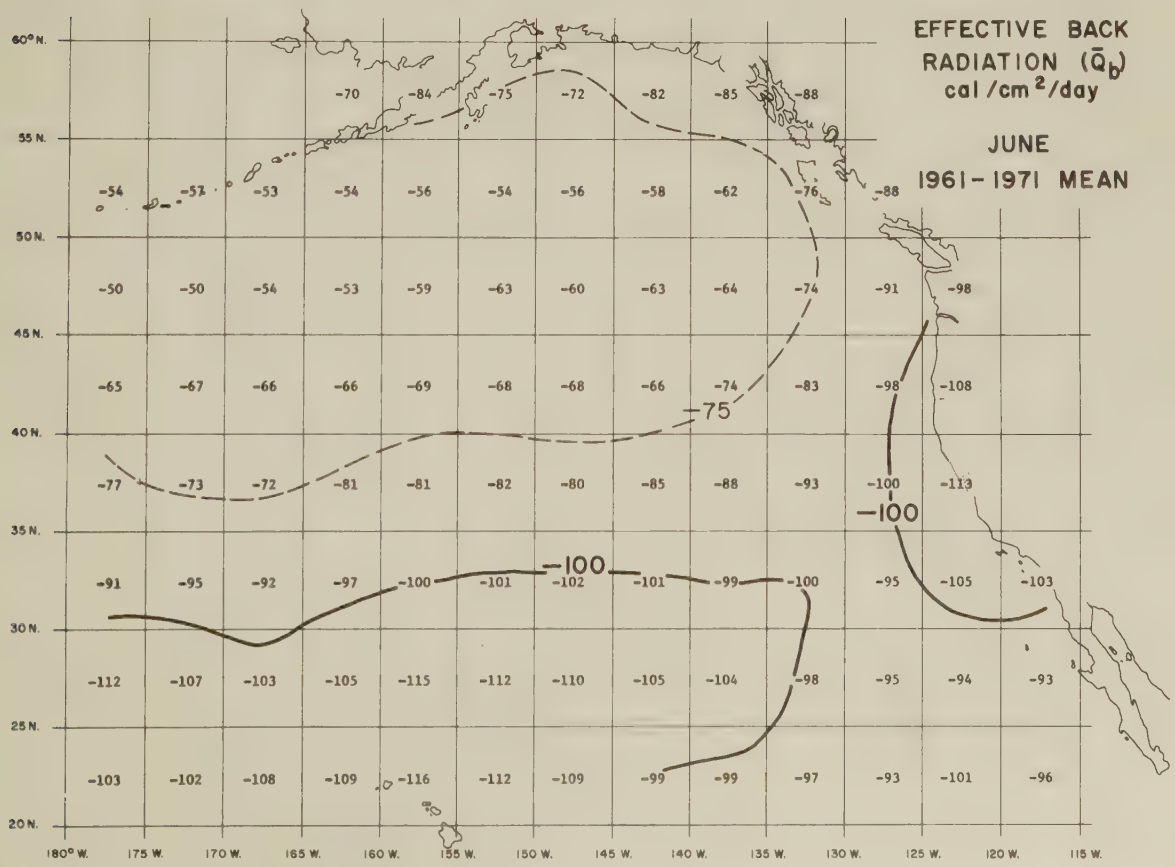


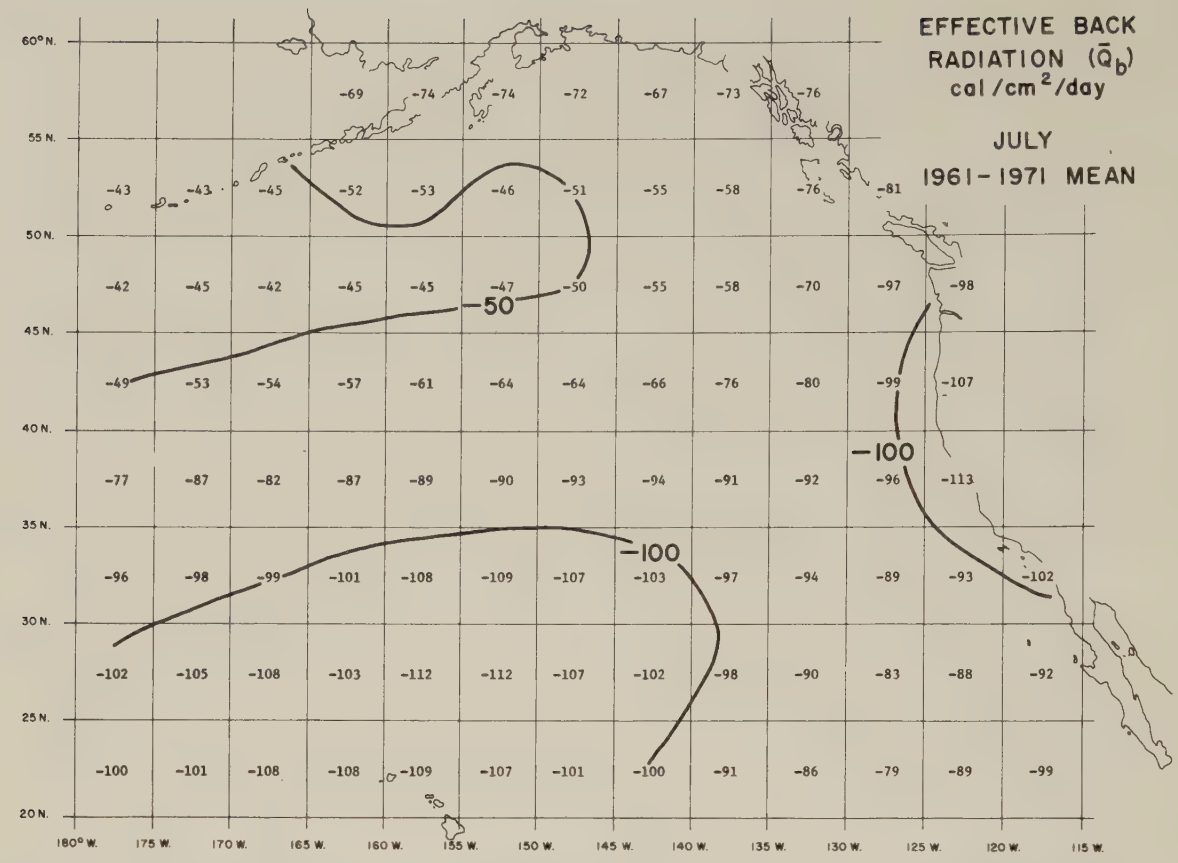


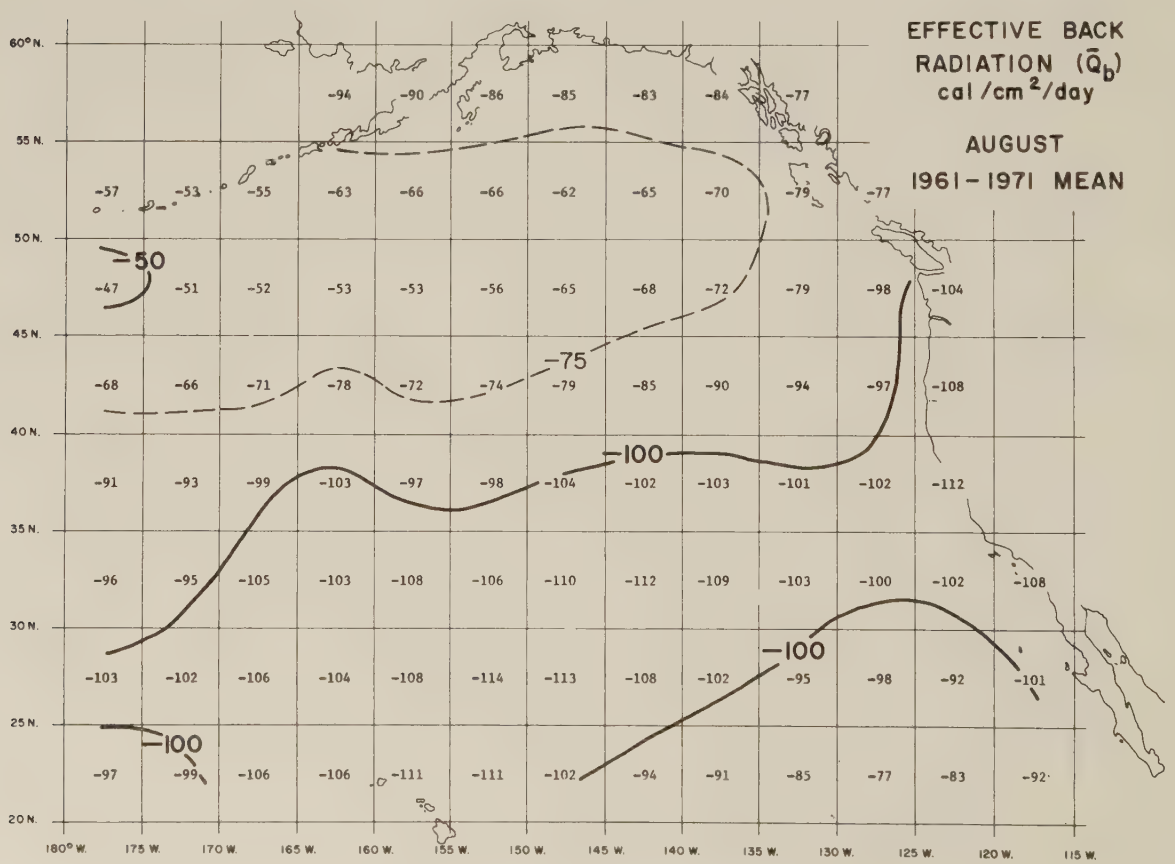

EFFECTIVE BACK RADIATION ($\bar{Q}_b$) cal/cm²/day
MARCH
1961-1971 MEAN
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
-77 -139 -120 -116 -104 -108 -133
-96 -89 -99 -103 -100 -97 -89 -92 -96 -108 -135
-96 -95 -94 -95 -99 -97 -95 -90 -103 -108 -119 -124
-113 -104 -98 -101 -101 -97 -99 -103 -110 -112 -117 -119
-104 -107 -107 -106 -108 -105 -109 -110 -114 -116 -120 -137
-111 -114 -111 -111 -110 -116 -118 -121 -116 -120 -120 -133 -139
-125 -122 -121 -115 -121 -124 -122 -118 -118 -116 -115 -123 -134
-123 -123 -127 -123 -125 -121 -118 -118 -115 -117 -112 -116 -129
-125
-100
-125
-125
-125
-125

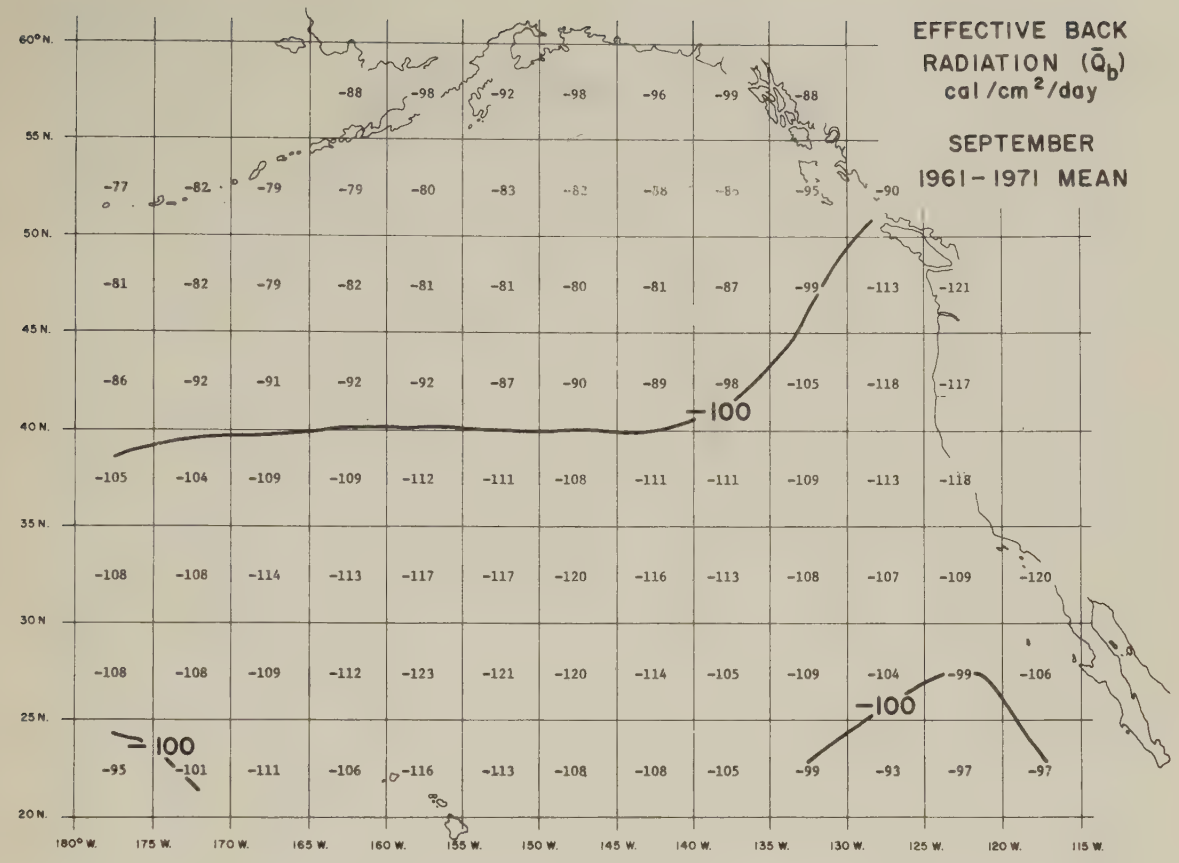

EFFECTIVE BACK RADIATION ($\bar{Q}_b$) cal/cm²/day
APRIL
1961-1971 MEAN
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
-71 -97 -112 -106 -103 -122 -110
-86 -88 -86 -93 -93 -93 -94 -95 -101 -108 -107
-84 -85 -86 -85 -87 -90 -91 -96 -96 -102 -106 -121
-91 -87 -90 -86 -90 -88 -93 -101 -101 -109 -117 -122
-106 -107 -101 -101 -99 -99 -103 -107 -108 -117 -124 -139
-105 -111 -109 -109 -105 -102 -109 -112 -115 -118 -122 -132 -139
-118 -121 -117 -114 -113 -120 -120 -117 -113 -116 -121 -121 -124
-119 -119 -119 -112 -119 -117 -113 -107 -105 -109 -107 -114 -116
-100
-125

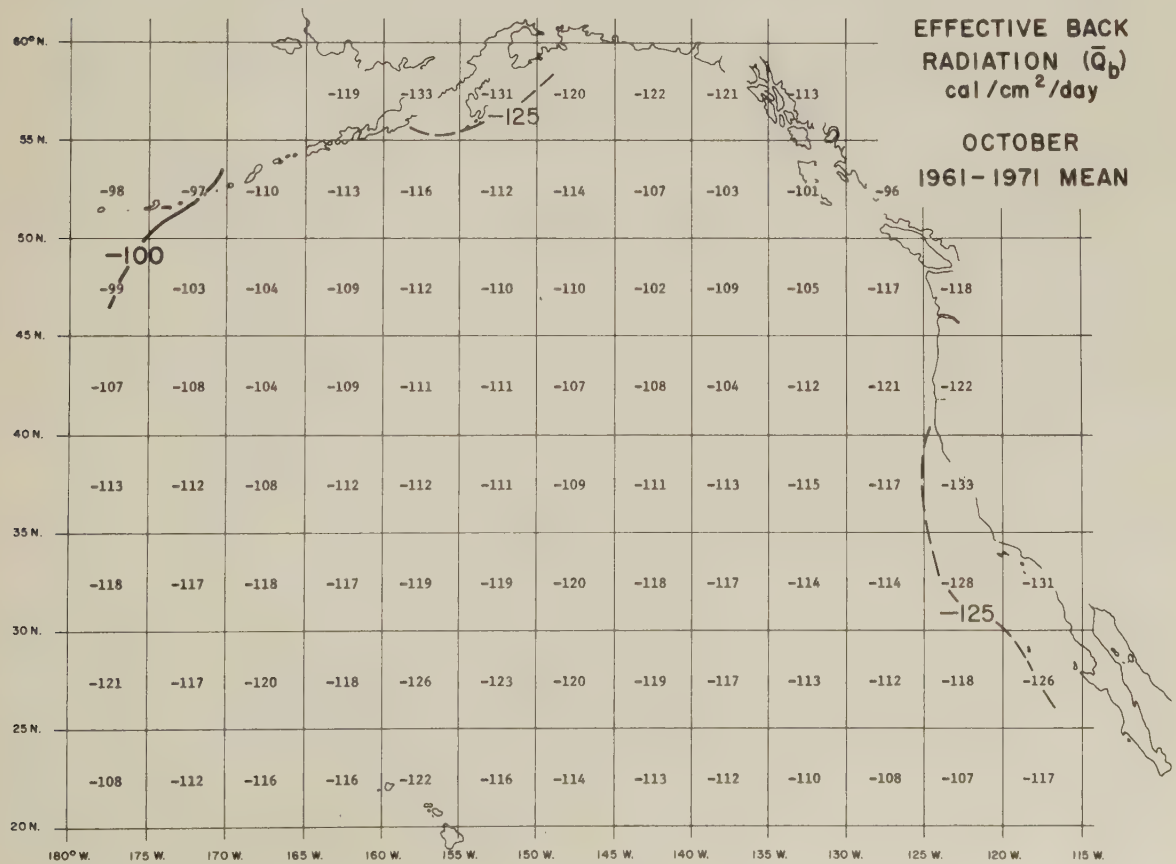

EFFECTIVE BACK RADIATION ($\bar{Q}_b$) cal /cm^2/day
MAY
1961 - 1971 MEAN
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
-75
-100
-90 -100 -96 -94 -92 -101 -99
-75 -75 -80 -80 -79 -74 -74 -74 -81 -99 -93
-70 -73 -75 -76 -72 -70 -76 -78 -87 -92 -104 -118
-73 -81 -80 -80 -85 -82 -81 -82 -95 -98 -109 -121
-98 -92 -93 -88 -92 -95 -97 -95 -98 -102 -111 -128
-106 -101 -98 -101 -106 -108 -109 -111 -111 -108 -108 -112 -115
-114 -113 -113 -110 -113 -124 -120 -117 -111 -106 -108 -110 -107
-108 -105 -112 -112 -116 -113 -113 -107 -102 -96 -95 -102 -115

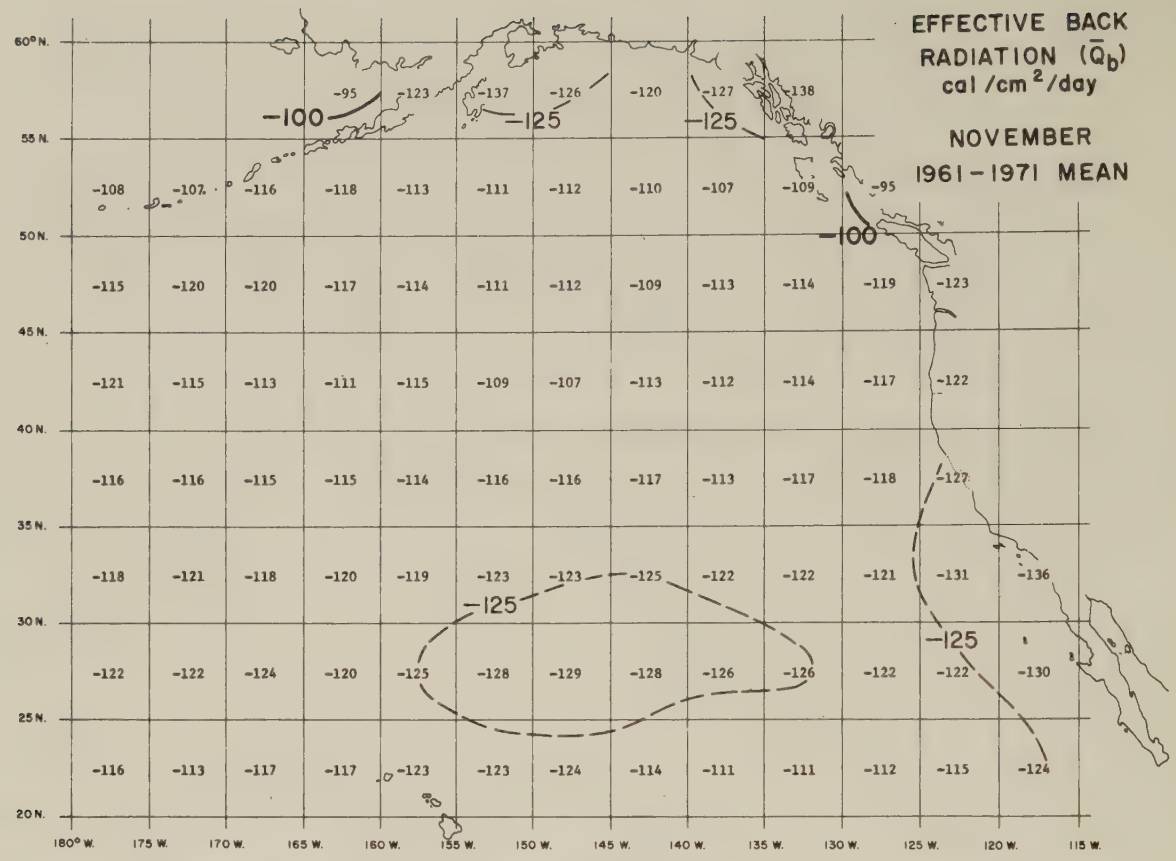

EFFECTIVE BACK RADIATION ($\bar{Q}_b$) cal /cm^2/day
JUNE
1961 - 1971 MEAN
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
-75
-100
-70 -84 -75 -72 -82 -85 -88
-54 -52 -53 -54 -56 -54 -56 -58 -62 -76 -88
-50 -50 -54 -53 -59 -63 -60 -63 -64 -74 -91 -98
-65 -67 -66 -66 -69 -68 -68 -66 -74 -83 -98 -108
-77 -73 -72 -81 -81 -82 -80 -85 -88 -93 -100 -113
-91 -95 -92 -97 -100 -101 -102 -101 -99 -100 -95 -105 -103
-112 -107 -103 -105 -115 -112 -110 -105 -104 -98 -95 -94 -93
-103 -102 -108 -109 -116 -112 -109 -99 -99 -97 -93 -101 -96

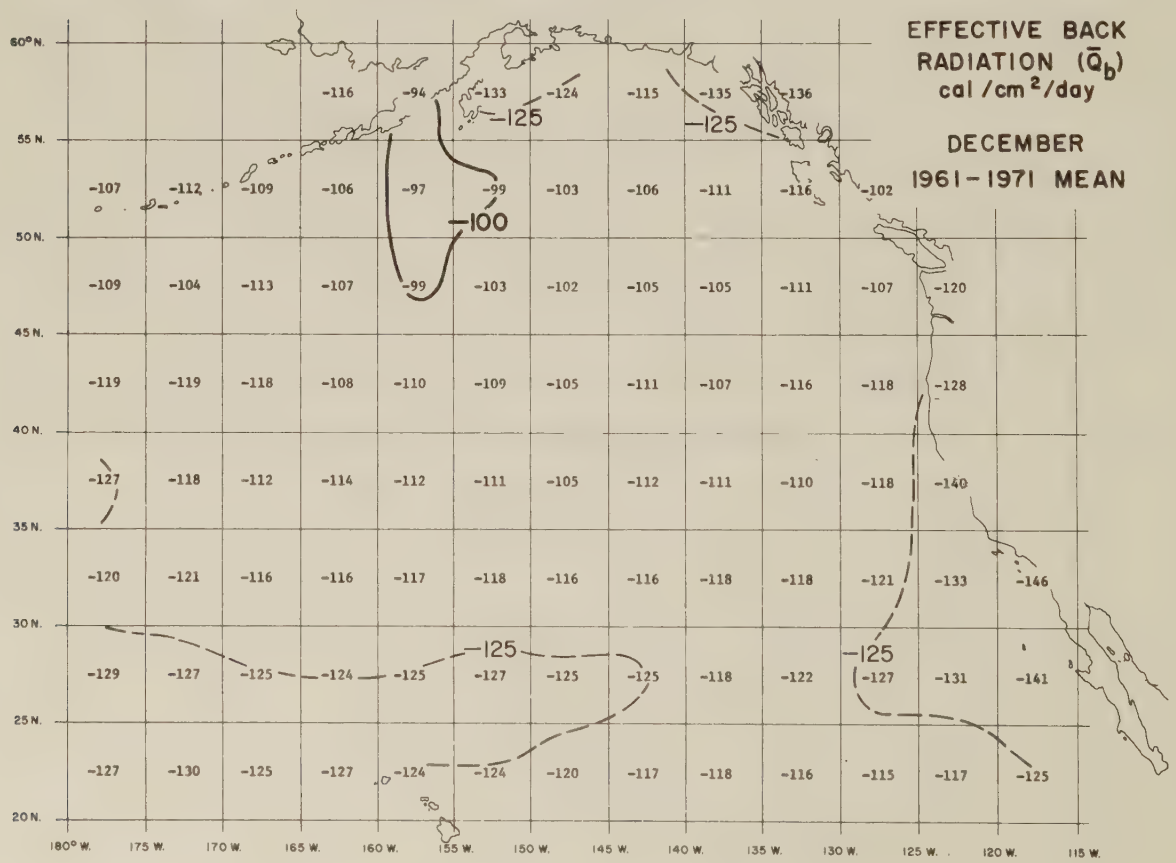

EFFECTIVE BACK RADIATION ($\bar{Q}_b$) cal/cm²/day
JULY
1961-1971 MEAN
60°N.
55 N.
50N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
-50
-100


EFFECTIVE BACK RADIATION ($\bar{Q}_b$) cal/cm²/day
AUGUST
1961-1971 MEAN
60°N.
55 N.
50N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
-50
-75
-100

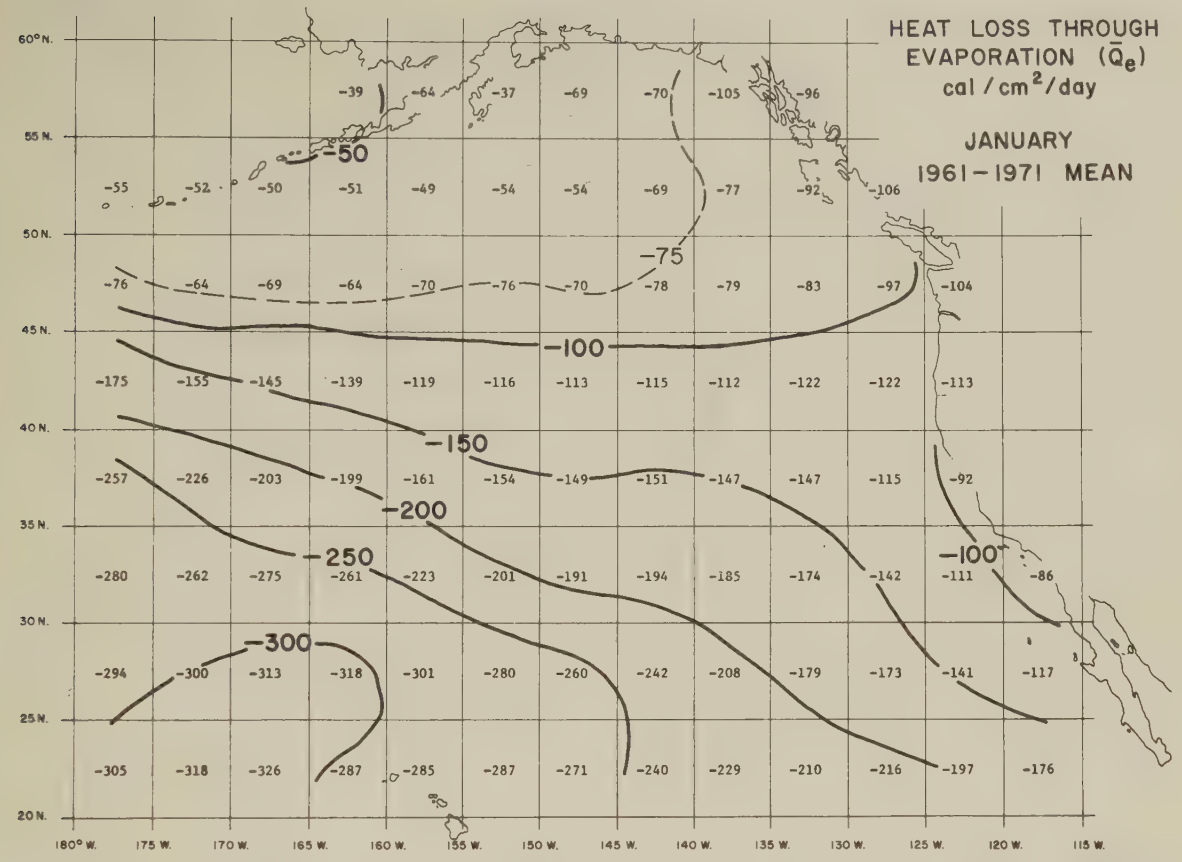

EFFECTIVE BACK RADIATION ($\bar{Q}_b$) cal/cm²/day
SEPTEMBER
1961-1971 MEAN
60°N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
-100
-100

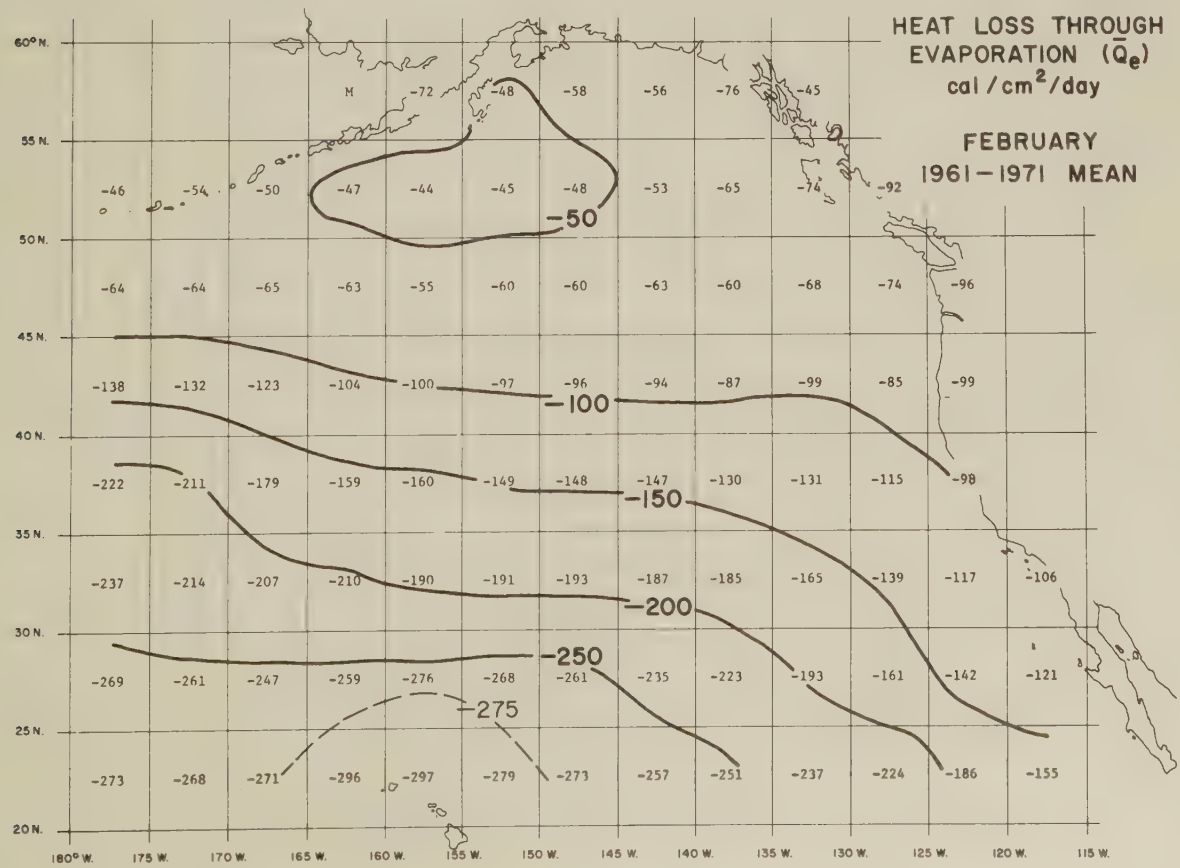

EFFECTIVE BACK RADIATION ($\bar{Q}_b$) cal/cm²/day
OCTOBER
1961-1971 MEAN
60°N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
-125
-100
-125

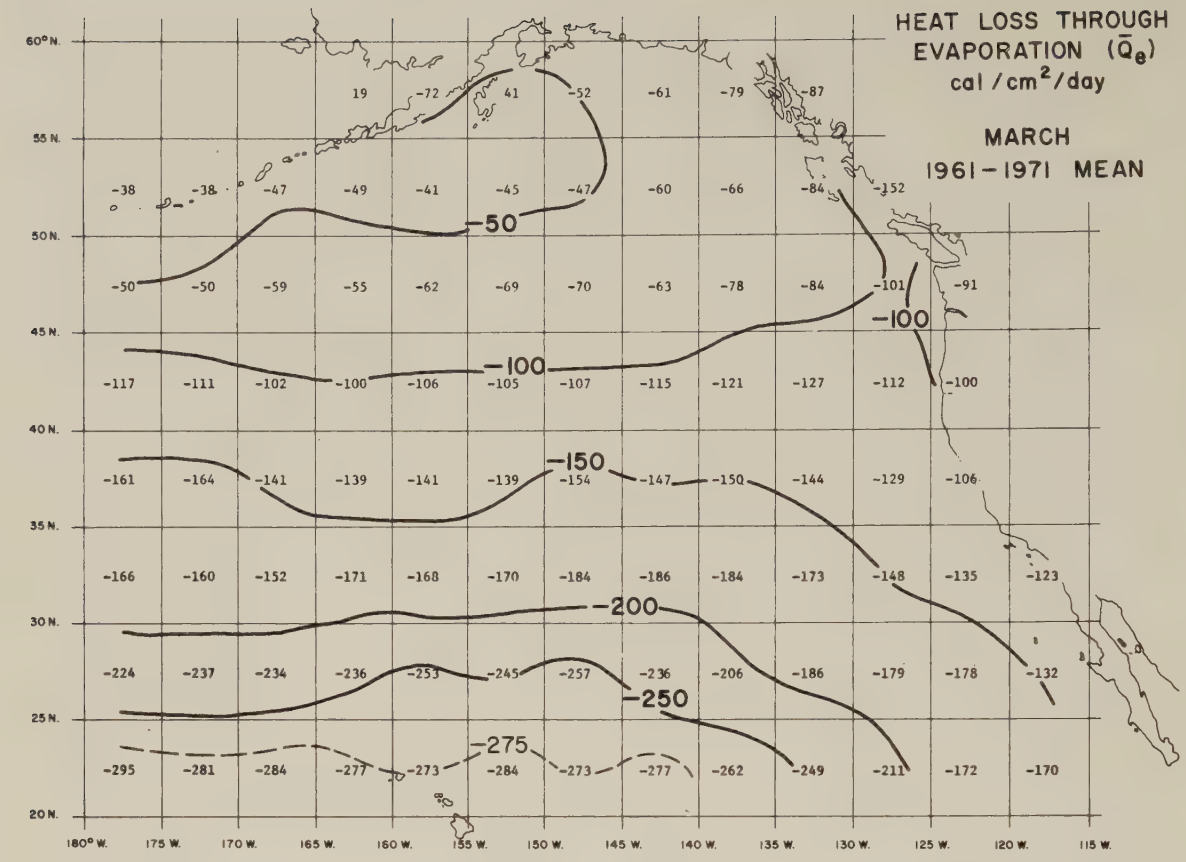

EFFECTIVE BACK RADIATION ($\bar{Q}_b$) cal /cm^2/day
NOVEMBER
1961 - 1971 MEAN
-100
-125
-125
-125
-125
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.

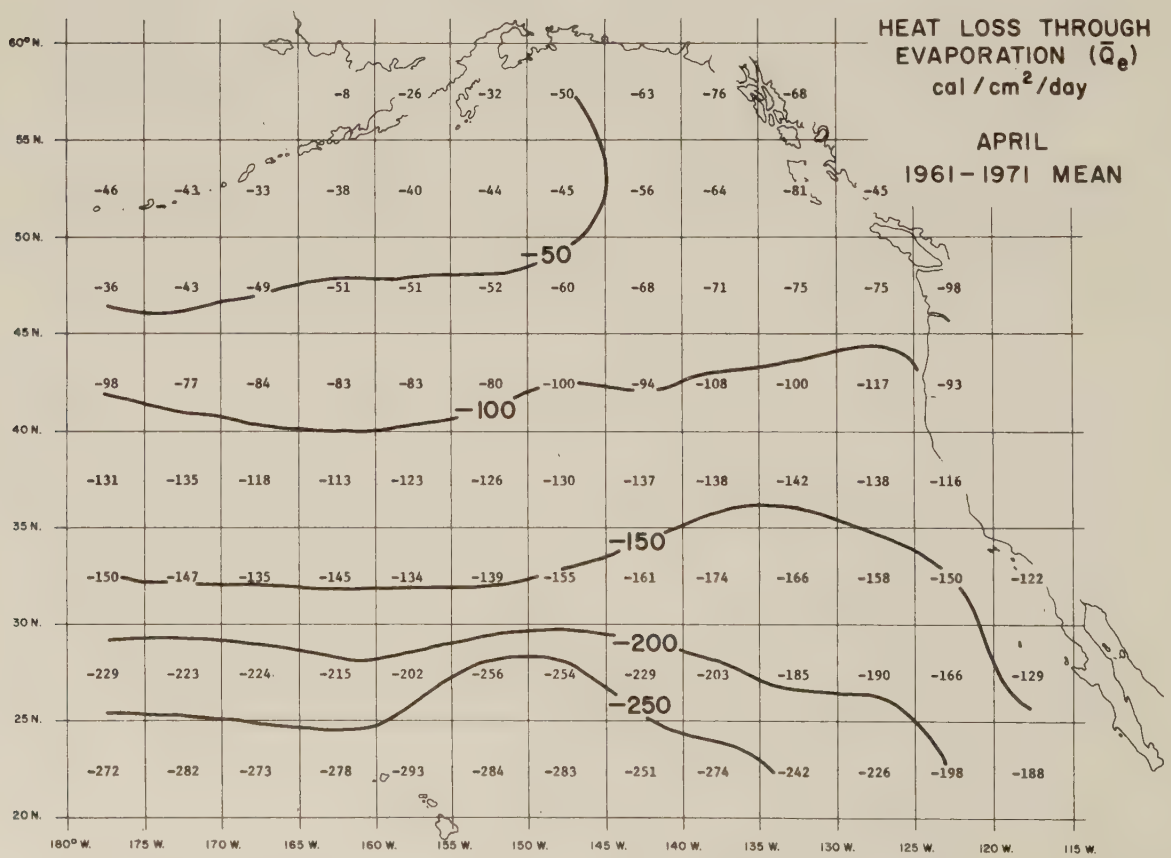

EFFECTIVE BACK RADIATION ($\bar{Q}_b$) cal /cm^2/day
DECEMBER
1961 - 1971 MEAN
-100
-125
-125
-125
-125
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.

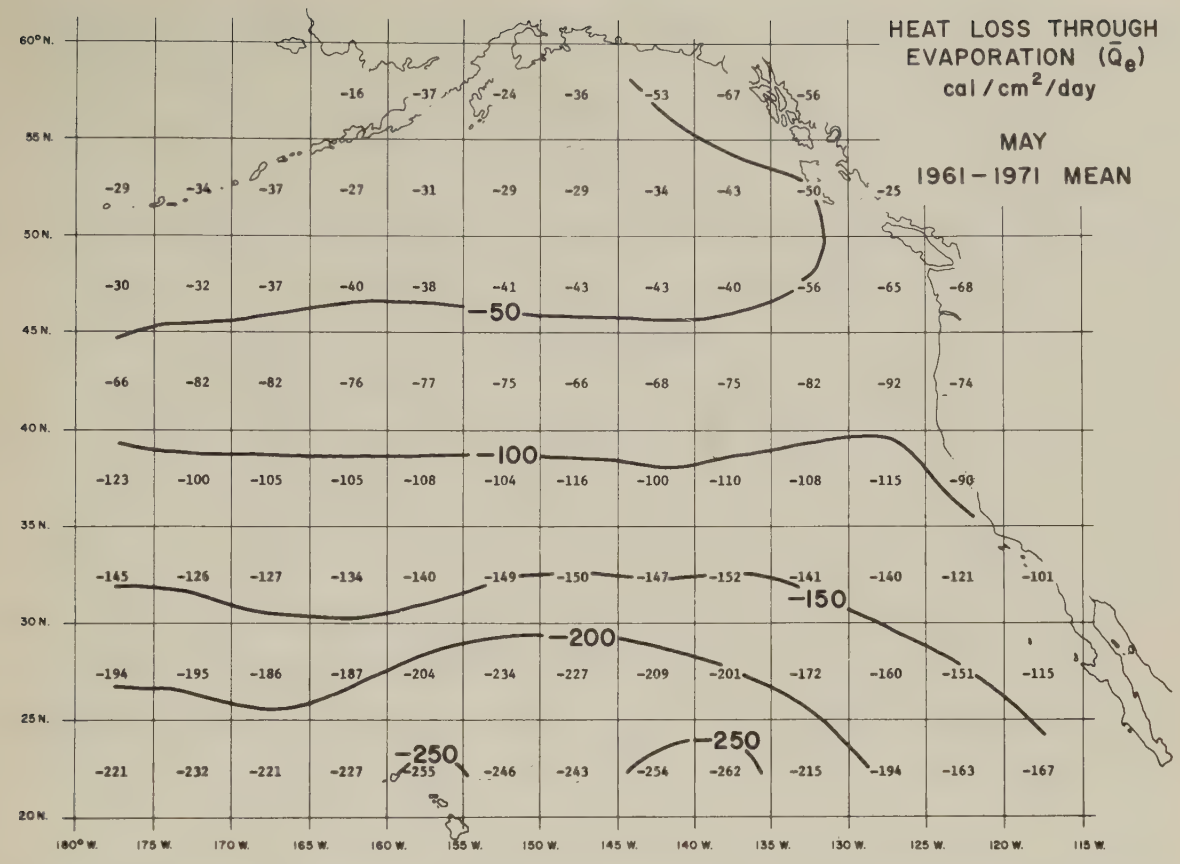
PART 5. EVAPORATIVE HEAT FLUX 1961-71 MEAN MONTHLY VALUES (NORMALS).

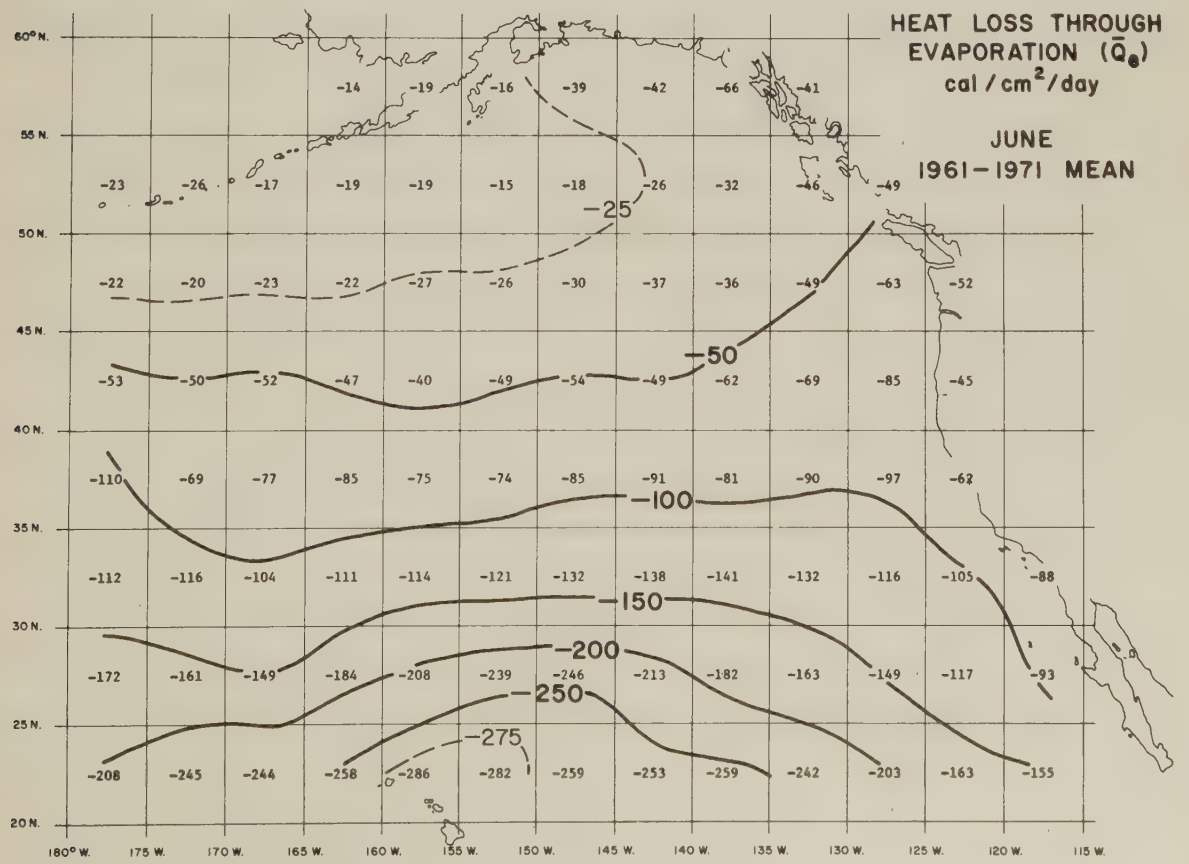


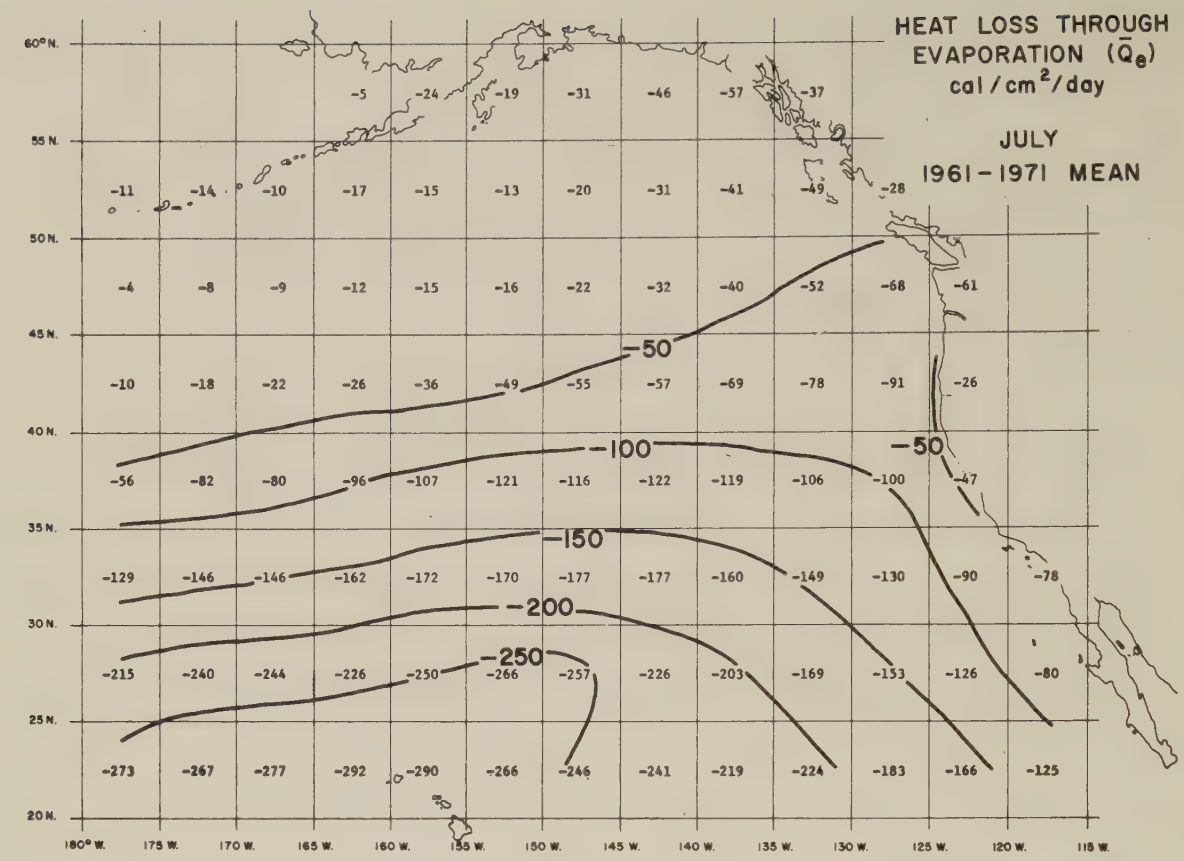


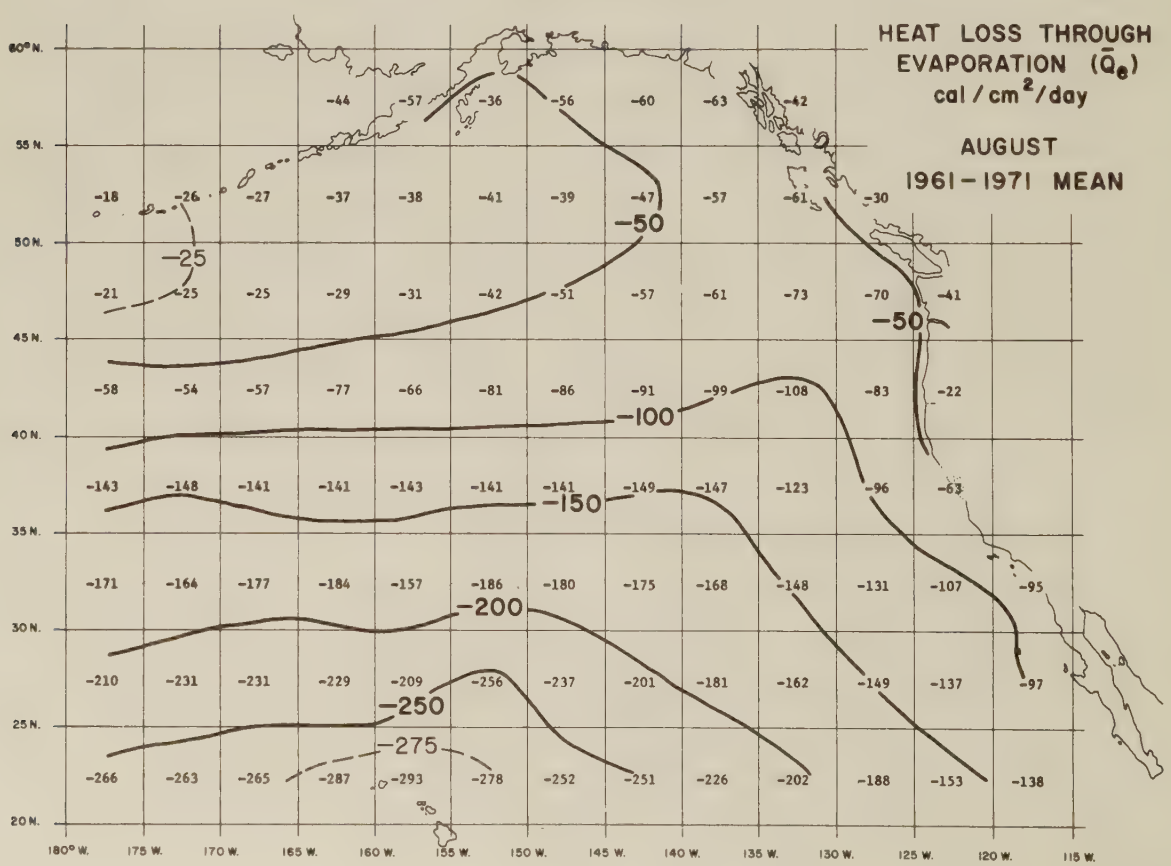

HEAT LOSS THROUGH EVAPORATION ($\bar{Q}_e$)
cal / cm^2 / day
MARCH
1961 – 1971 MEAN
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
19 -72 41 -52 -61 -79 -87
-38 -38 -47 -49 -41 -45 -47 -60 -66 -84 -152
-50
-50 -50 -59 -55 -62 -69 -70 -63 -78 -84 -101 -91
-100
-100
-117 -111 -102 -100 -106 -105 -107 -115 -121 -127 -112 -100
-150
-161 -164 -141 -139 -141 -139 -154 -147 -150 -144 -129 -106
-166 -160 -152 -171 -168 -170 -184 -186 -184 -173 -148 -135 -123
-200
-224 -237 -234 -236 -253 -245 -257 -236 -206 -186 -179 -178 -132
-250
-275
-295 -281 -284 -277 -273 -284 -273 -277 -262 -249 -211 -172 -170

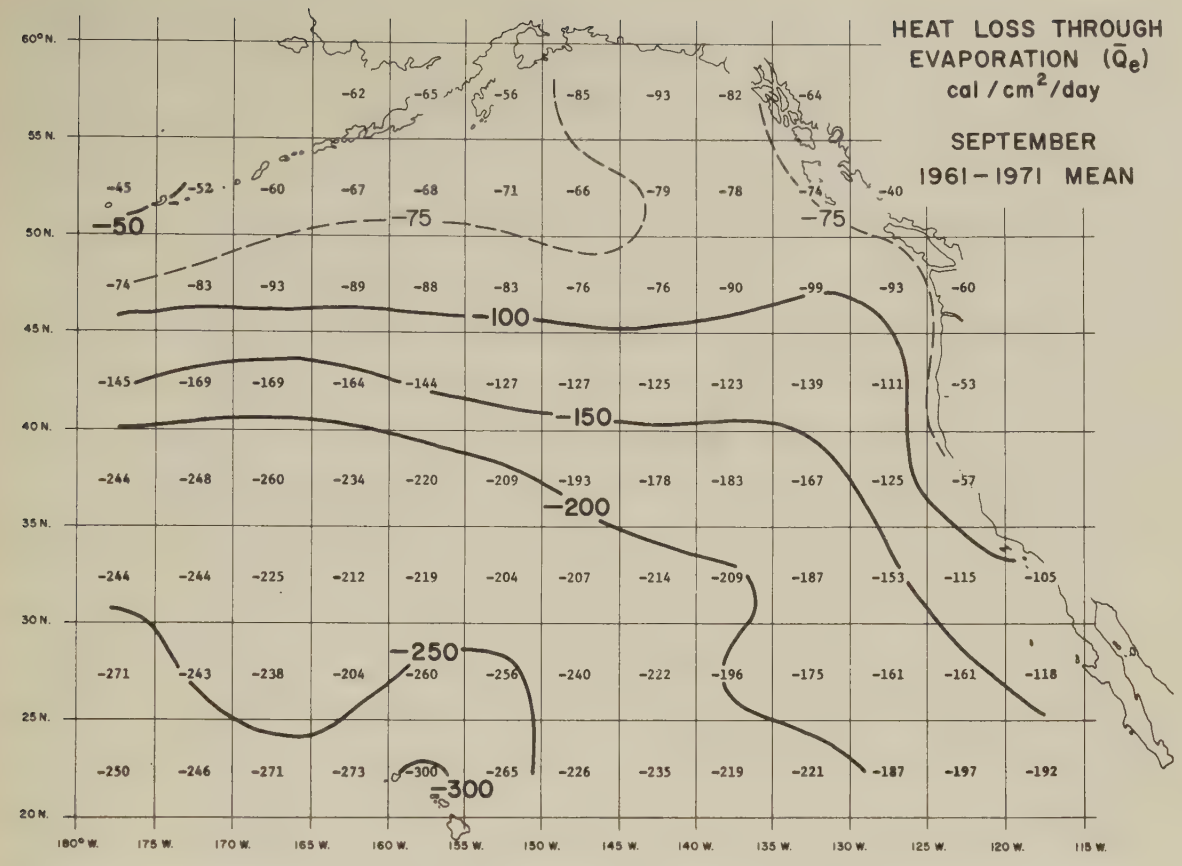

HEAT LOSS THROUGH EVAPORATION ($\bar{Q}_e$)
cal / cm^2 / day
APRIL
1961 – 1971 MEAN
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
-8 -26 -32 -50 -63 -76 -68
-46 -43 -33 -38 -40 -44 -45 -56 -64 -81 -45
-50
-36 -43 -49 -51 -51 -52 -60 -68 -71 -75 -75 -98
-98 -77 -84 -83 -83 -80 -100 -94 -108 -100 -117 -93
-100
-131 -135 -118 -113 -123 -126 -130 -137 -138 -142 -138 -116
-150
-150 -147 -135 -145 -134 -139 -155 -161 -174 -166 -158 -150 -122
-200
-229 -223 -224 -215 -202 -256 -254 -229 -203 -185 -190 -166 -129
-250
-272 -282 -273 -278 -293 -284 -283 -251 -274 -242 -226 -198 -188

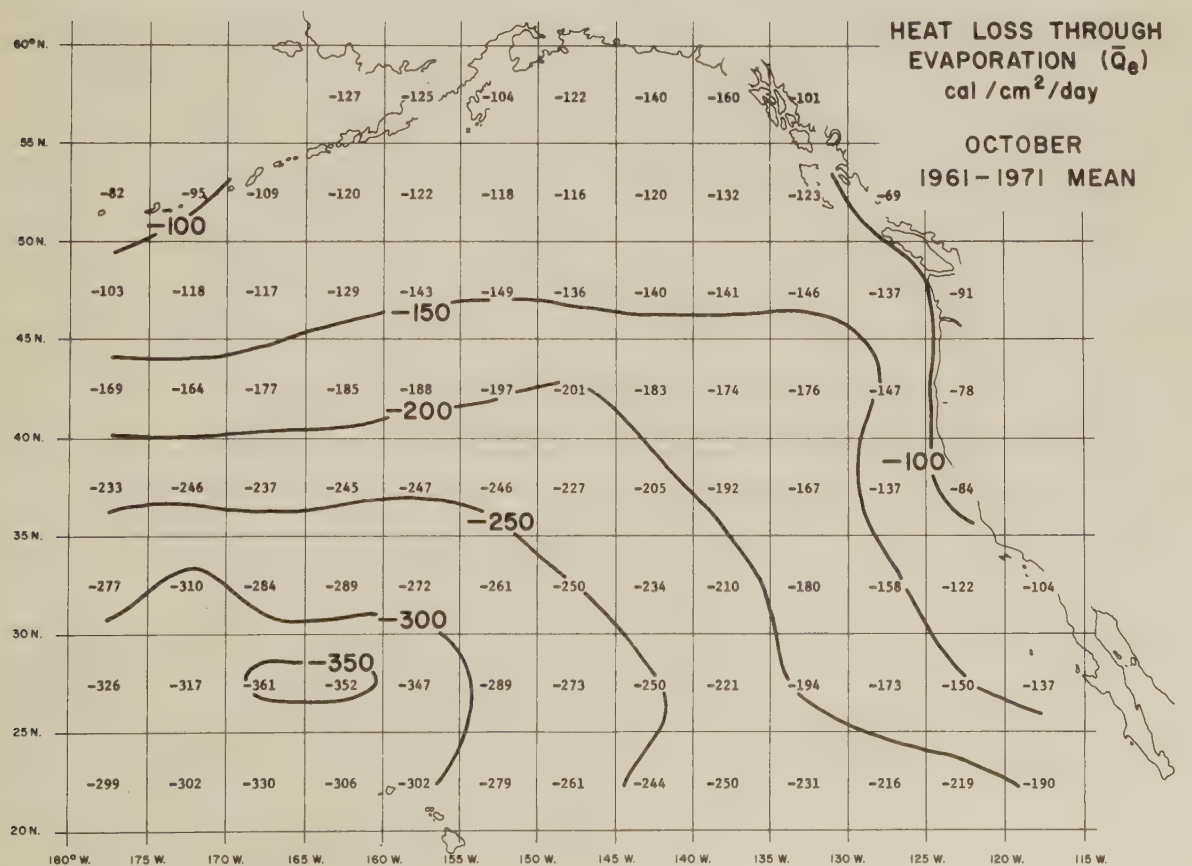

HEAT LOSS THROUGH EVAPORATION ($\bar{Q}_e$)
cal / cm^2 / day
MAY
1961 – 1971 MEAN
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
-16 -37 -24 -36 -53 -67 -56
-29 -34 -37 -27 -31 -29 -29 -34 -43 -50 -25
-30 -32 -37 -40 -38 -41 -43 -43 -40 -56 -65 -68
-50
-66 -82 -82 -76 -77 -75 -66 -68 -75 -82 -92 -74
-100
-123 -100 -105 -105 -108 -104 -116 -100 -110 -108 -115 -90
-145 -126 -127 -134 -140 -149 -150 -147 -152 -141 -140 -121 -101
-150
-200
-194 -195 -186 -187 -204 -234 -227 -209 -201 -172 -160 -151 -115
-250
-250
-221 -232 -221 -227 -235 -246 -243 -254 -262 -215 -194 -163 -167

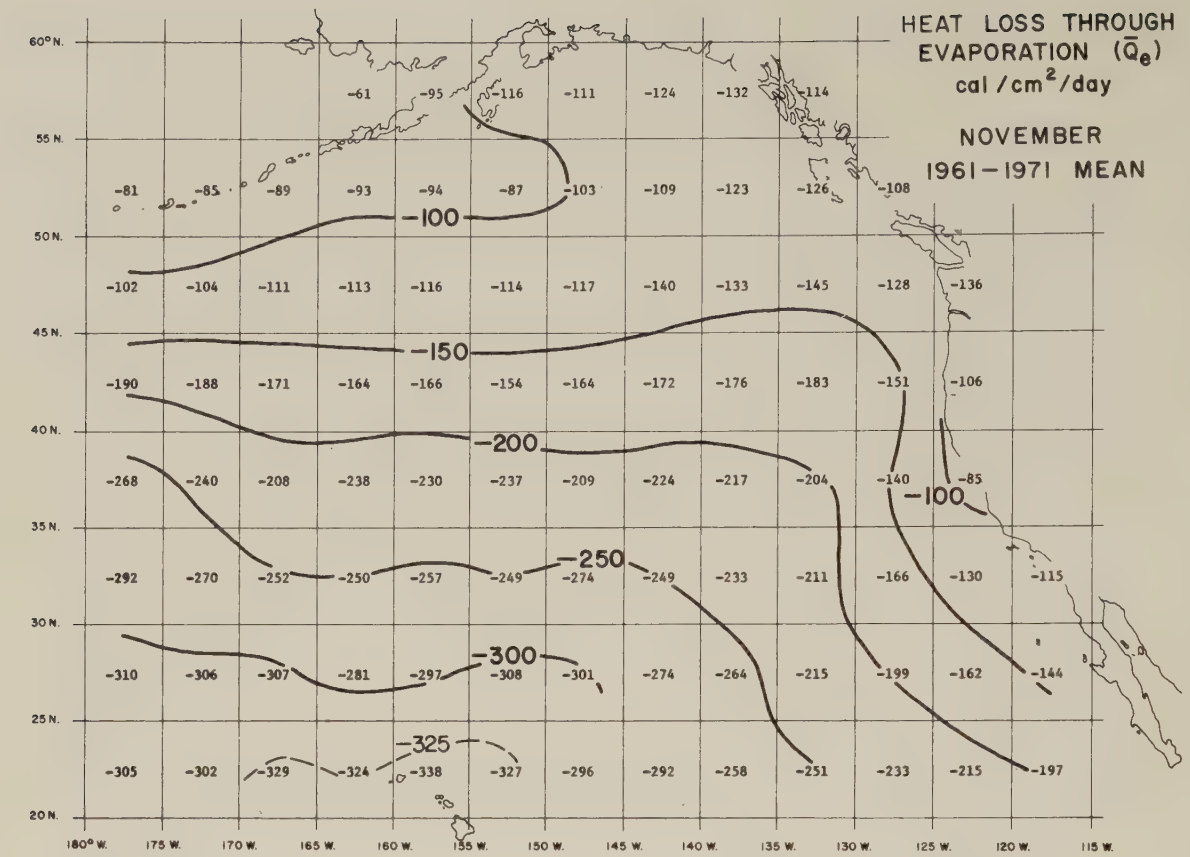

HEAT LOSS THROUGH EVAPORATION ($\bar{Q}_e$)
cal / cm^2 / day
JUNE
1961 – 1971 MEAN
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
-14 -19 -16 -39 -42 -66 -41
-23 -26 -17 -19 -19 -15 -18 -26 -32 -46 -49
-25
-22 -20 -23 -22 -27 -26 -30 -37 -36 -49 -63 -52
-50
-53 -50 -52 -47 -40 -49 -54 -49 -62 -69 -85 -45
-110 -69 -77 -85 -75 -74 -85 -91 -81 -90 -97 -62
-100
-112 -116 -104 -111 -114 -121 -132 -138 -141 -132 -116 -105 -88
-150
-200
-172 -161 -149 -184 -208 -239 -246 -213 -182 -163 -149 -117 -93
-250
-275
-208 -245 -244 -258 -286 -282 -259 -253 -259 -242 -203 -163 -155

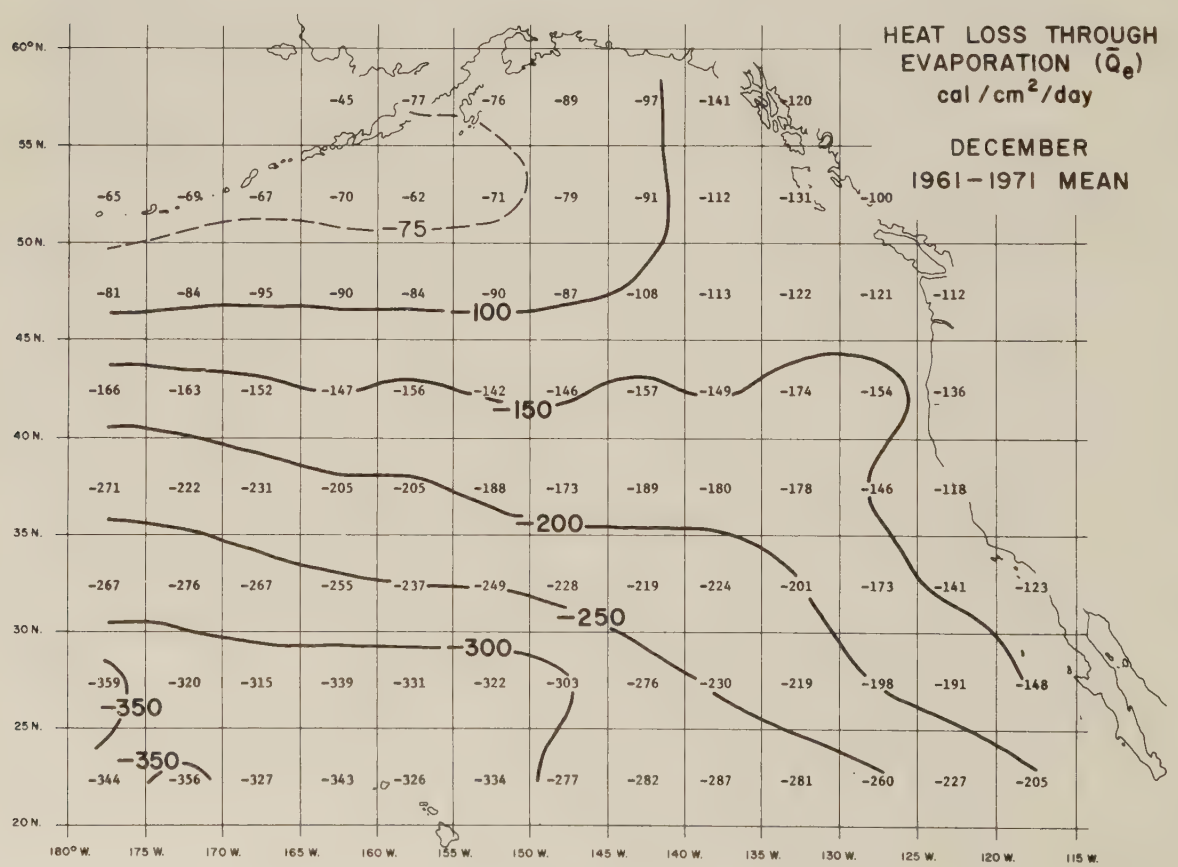

HEAT LOSS THROUGH EVAPORATION ($\bar{Q}_e$)
cal / cm^2 / day
JULY
1961 – 1971 MEAN
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
-5 -24 -19 -31 -46 -57 -37
-11 -14 -10 -17 -15 -13 -20 -31 -41 -49 -28
-4 -8 -9 -12 -15 -16 -22 -32 -40 -52 -68 -61
-10 -18 -22 -26 -36 -49 -55 -57 -69 -78 -91 -26
-56 -82 -80 -96 -107 -121 -116 -122 -119 -106 -100 -47
-129 -146 -146 -162 -172 -170 -177 -177 -160 -149 -130 -90 -78
-215 -240 -244 -226 -250 -266 -257 -226 -203 -169 -153 -126 -80
-273 -267 -277 -292 -290 -266 -246 -241 -219 -224 -183 -166 -125
-50
-100
-150
-200
-250
-50


HEAT LOSS THROUGH EVAPORATION ($\bar{Q}_e$)
cal / cm^2 / day
AUGUST
1961 – 1971 MEAN
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
-44 -57 -36 -56 -60 -63 -42
-18 -26 -27 -37 -38 -41 -39 -47 -57 -61 -30
-21 -25 -25 -29 -31 -42 -51 -57 -61 -73 -70 -41
-58 -54 -57 -77 -66 -81 -86 -91 -99 -108 -83 -22
-143 -148 -141 -141 -143 -141 -141 -149 -147 -123 -96 -63
-171 -164 -177 -184 -157 -186 -180 -175 -168 -148 -131 -107 -95
-210 -231 -231 -229 -209 -256 -237 -201 -181 -162 -149 -137 -97
-266 -263 -265 -287 -293 -278 -252 -251 -226 -202 -188 -153 -138
-25
-50
-50
-100
-150
-200
-250
-275

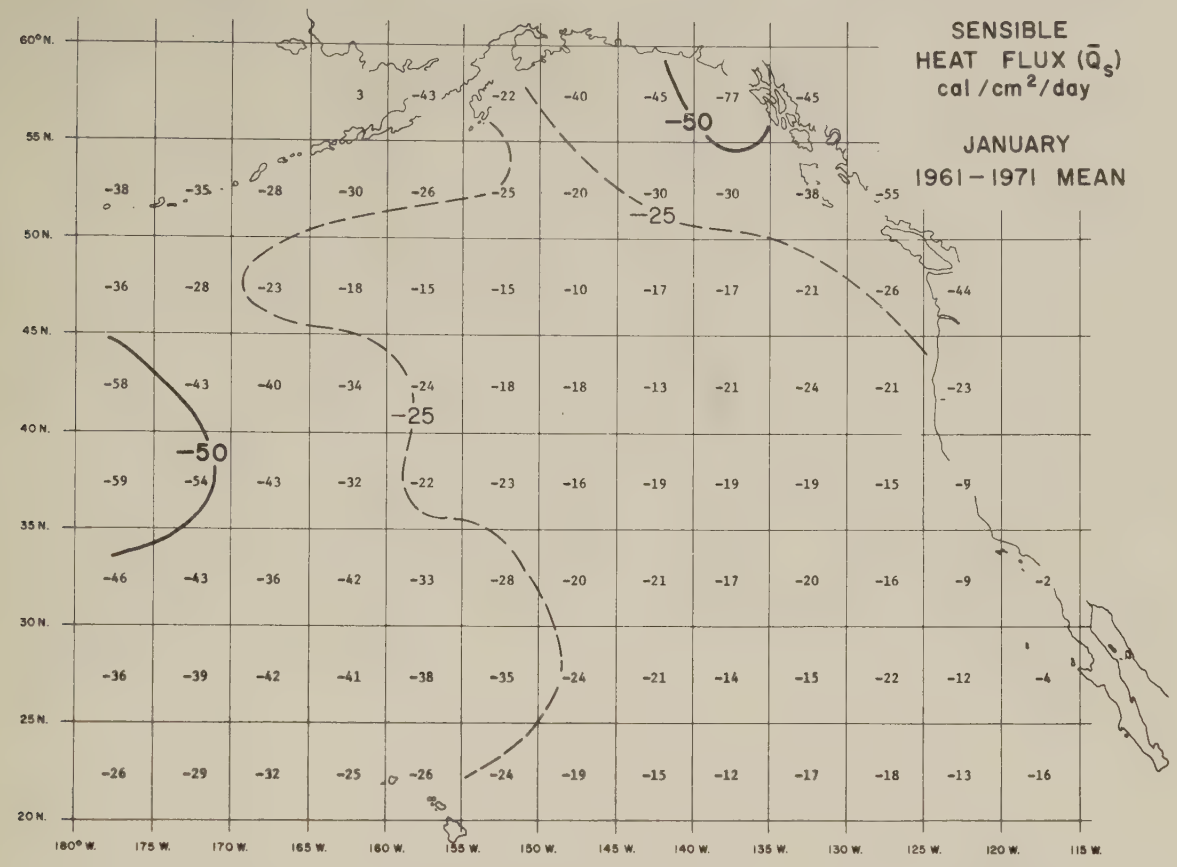

HEAT LOSS THROUGH EVAPORATION ($\bar{Q}_e$)
cal / cm^2/day
SEPTEMBER
1961 – 1971 MEAN
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
-50
-75
-100
-150
-200
-250
-300
-62 -65 -56 -85 -93 -82 -64
-45 -52 -60 -67 -68 -71 -66 -79 -78 -74 -40
-74 -83 -93 -89 -88 -83 -76 -76 -90 -99 -93 -60
-145 -169 -169 -164 -144 -127 -127 -125 -123 -139 -111 -53
-244 -248 -260 -234 -220 -209 -193 -178 -183 -167 -125 -57
-244 -244 -225 -212 -219 -204 -207 -214 -209 -187 -153 -115 -105
-271 -243 -238 -204 -260 -256 -240 -222 -196 -175 -161 -161 -118
-250 -246 -271 -273 -300 -265 -226 -235 -219 -221 -187 -197 -192

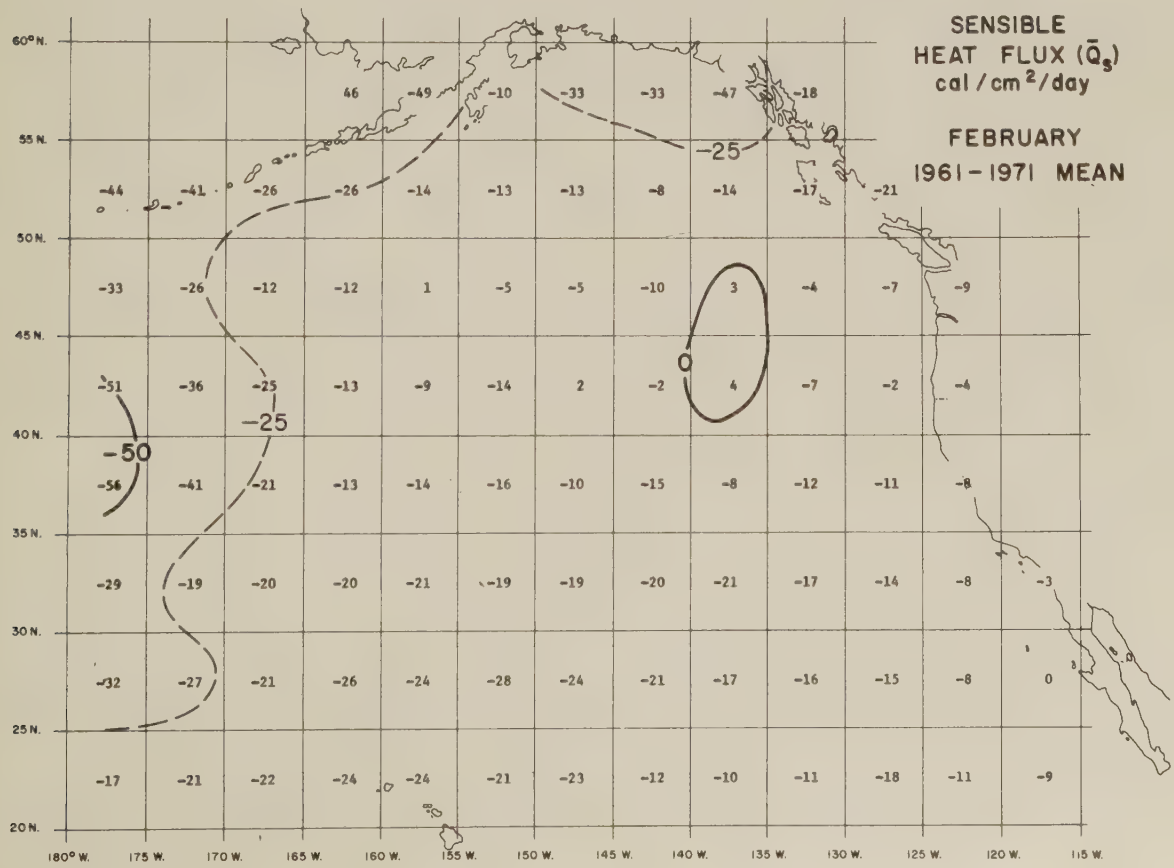

HEAT LOSS THROUGH EVAPORATION ($\bar{Q}_e$)
cal / cm^2/day
OCTOBER
1961 – 1971 MEAN
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
-100
-150
-200
-250
-300
-350
-127 -125 -104 -122 -140 -160 -101
-82 -95 -109 -120 -122 -118 -116 -120 -132 -123 -69
-103 -118 -117 -129 -143 -149 -136 -140 -141 -146 -137 -91
-169 -164 -177 -185 -188 -197 -201 -183 -174 -176 -147 -78
-233 -246 -237 -245 -247 -246 -227 -205 -192 -167 -137 -84
-277 -310 -284 -289 -272 -261 -250 -234 -210 -180 -158 -122 -104
-326 -317 -361 -352 -347 -289 -273 -250 -221 -194 -173 -150 -137
-299 -302 -330 -306 -302 -279 -261 -244 -250 -231 -216 -219 -190

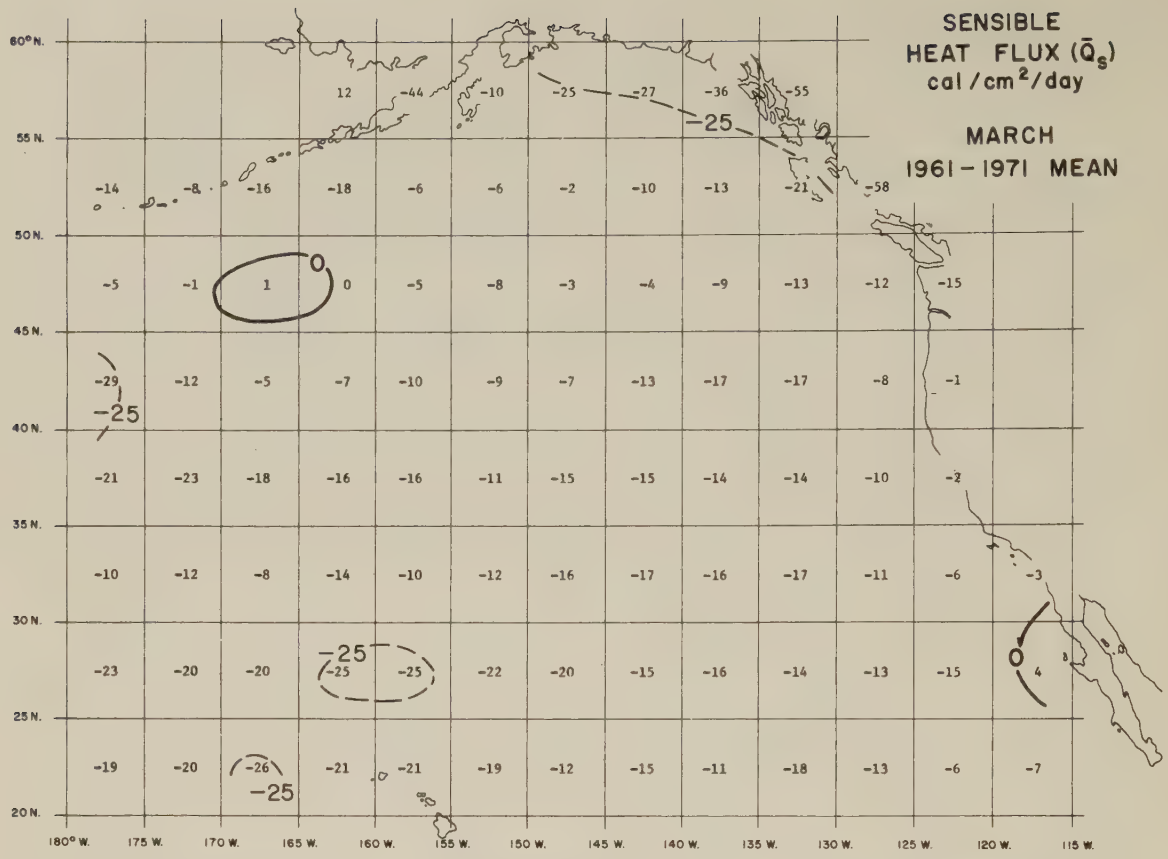

HEAT LOSS THROUGH EVAPORATION ($\bar{Q}_e$)
cal / cm^2/day
NOVEMBER
1961 – 1971 MEAN
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
-61 -95 -116 -111 -124 -132 -114
-81 -85 -89 -93 -94 -87 -103 -109 -123 -126 -108
-100
-102 -104 -111 -113 -116 -114 -117 -140 -133 -145 -128 -136
-150
-190 -188 -171 -164 -166 -154 -164 -172 -176 -183 -151 -106
-200
-268 -240 -208 -238 -230 -237 -209 -224 -217 -204 -140 -85
-100
-250
-292 -270 -252 -250 -257 -249 -274 -249 -233 -211 -166 -130 -115
-300
-310 -306 -307 -281 -297 -308 -301 -274 -264 -215 -199 -162 -144
-325
-305 -302 -329 -324 -338 -327 -296 -292 -258 -251 -233 -215 -197

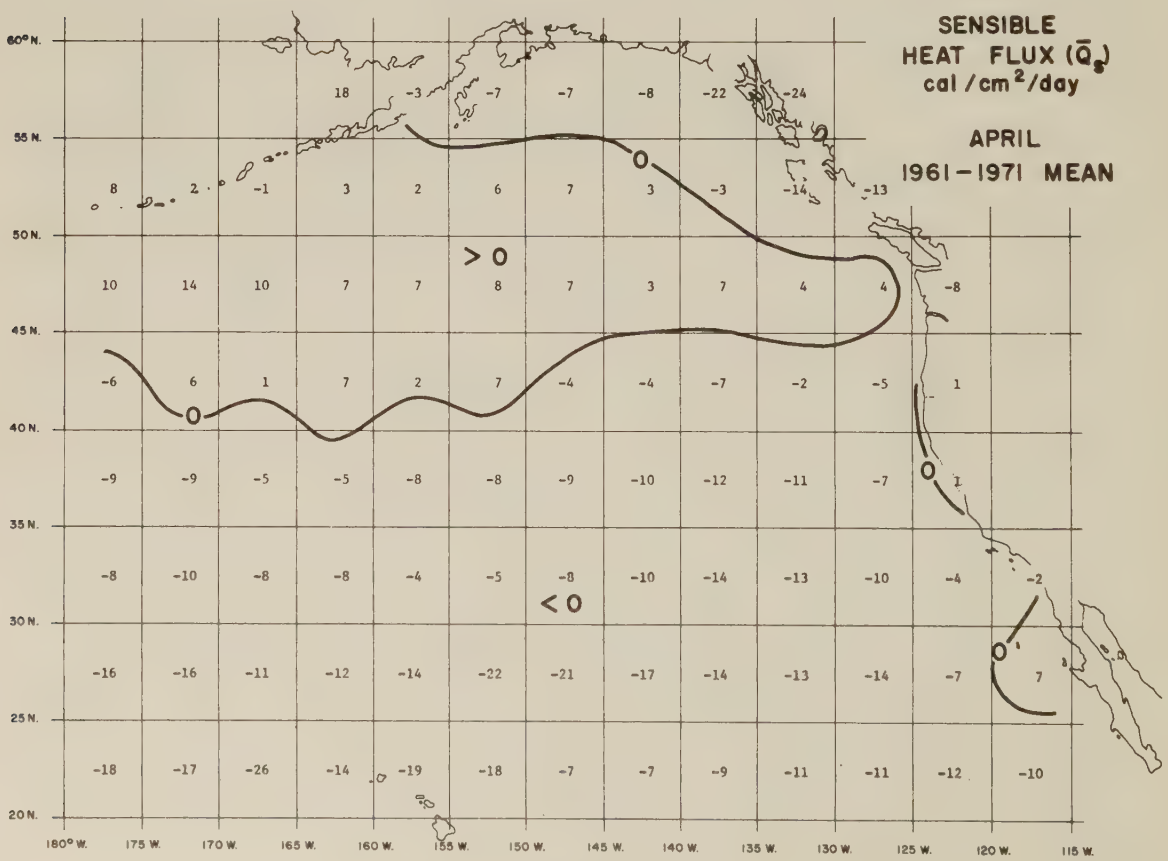

HEAT LOSS THROUGH EVAPORATION ($\bar{Q}_e$)
cal / cm^2/day
DECEMBER
1961 – 1971 MEAN
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
-45 -77 -76 -89 -97 -141 -120
-65 -69 -67 -70 -62 -71 -79 -91 -112 -131 -100
-75
-81 -84 -95 -90 -84 -90 -87 -108 -113 -122 -121 -112
-100
-166 -163 -152 -147 -156 -142 -146 -157 -149 -174 -154 -136
-150
-271 -222 -231 -205 -205 -188 -173 -189 -180 -178 -146 -118
-200
-267 -276 -267 -255 -237 -249 -228 -219 -224 -201 -173 -141 -123
-250
-300
-359 -320 -315 -339 -331 -322 -303 -276 -230 -219 -198 -191 -148
-350
-350
-344 -356 -327 -343 -326 -334 -277 -282 -287 -281 -260 -227 -205

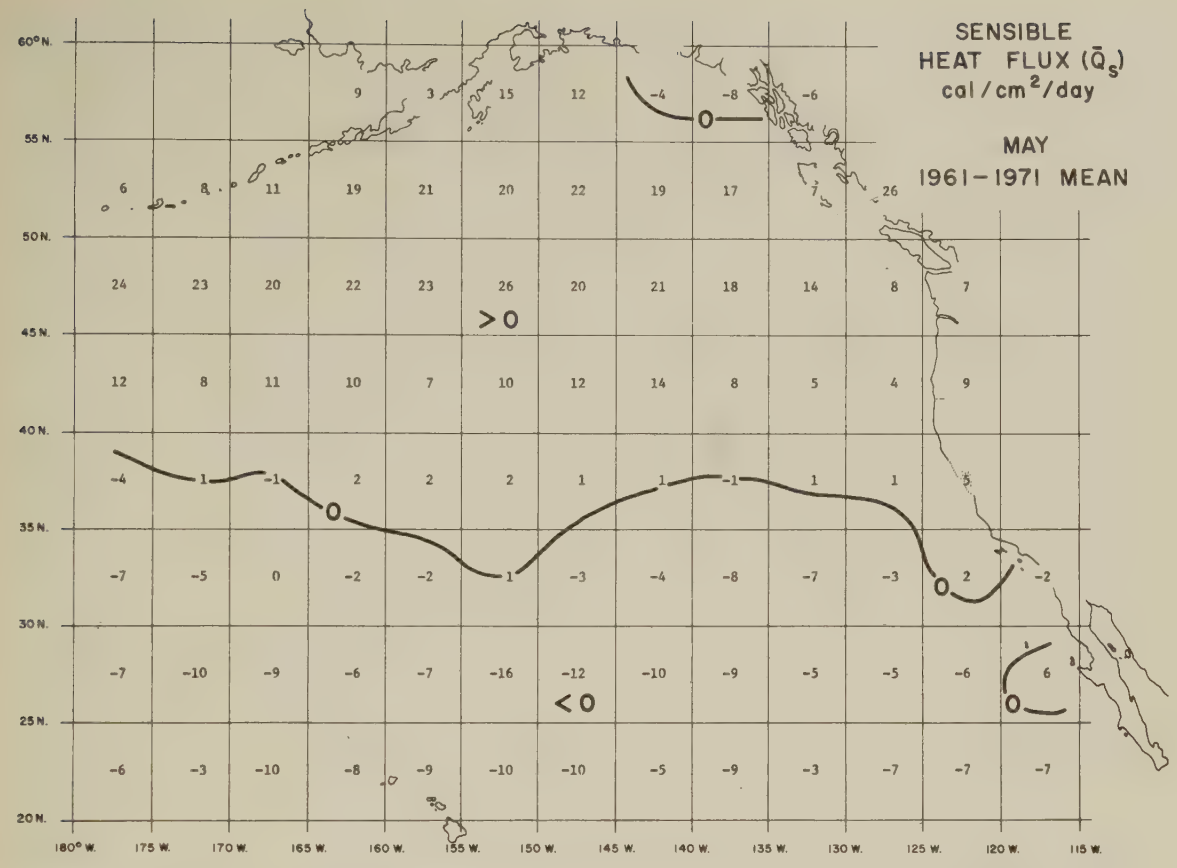
PART 6. SENSIBLE HEAT FLUX 1961-71 MEAN MONTHLY VALUES (NORMALS).

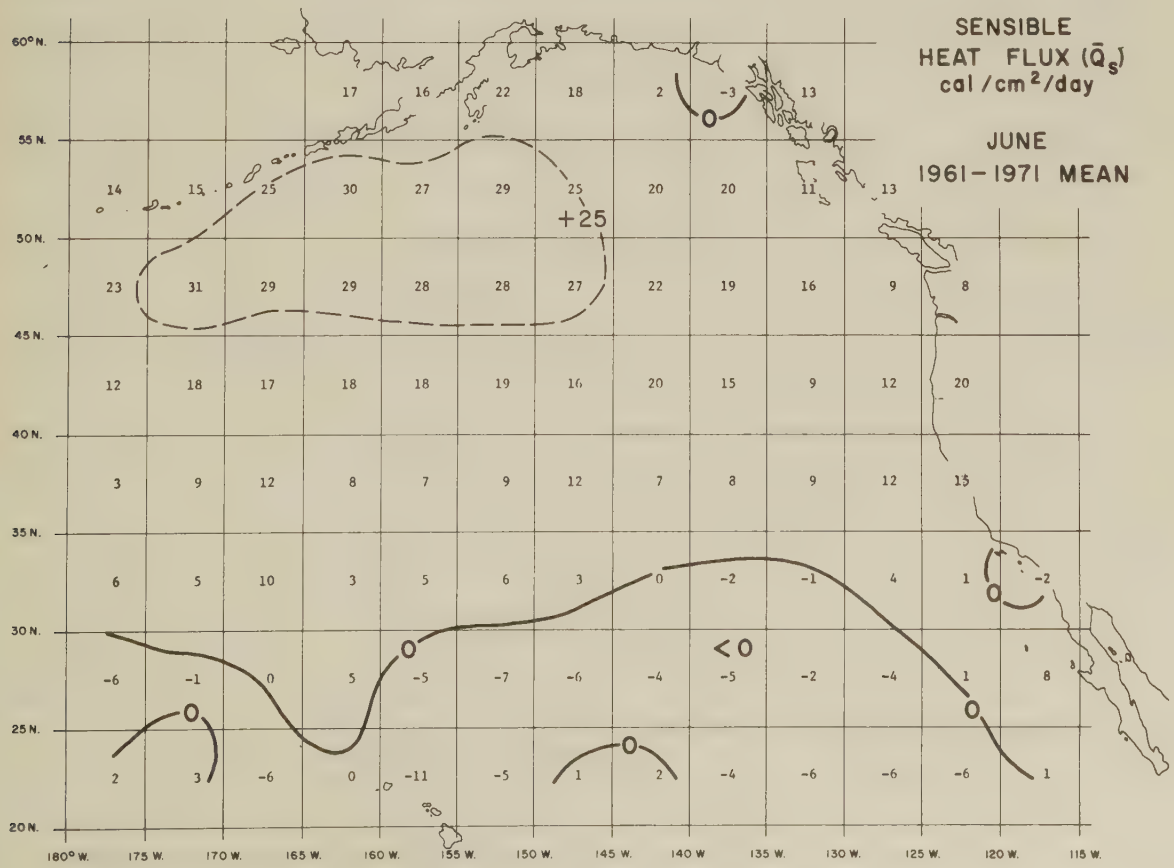


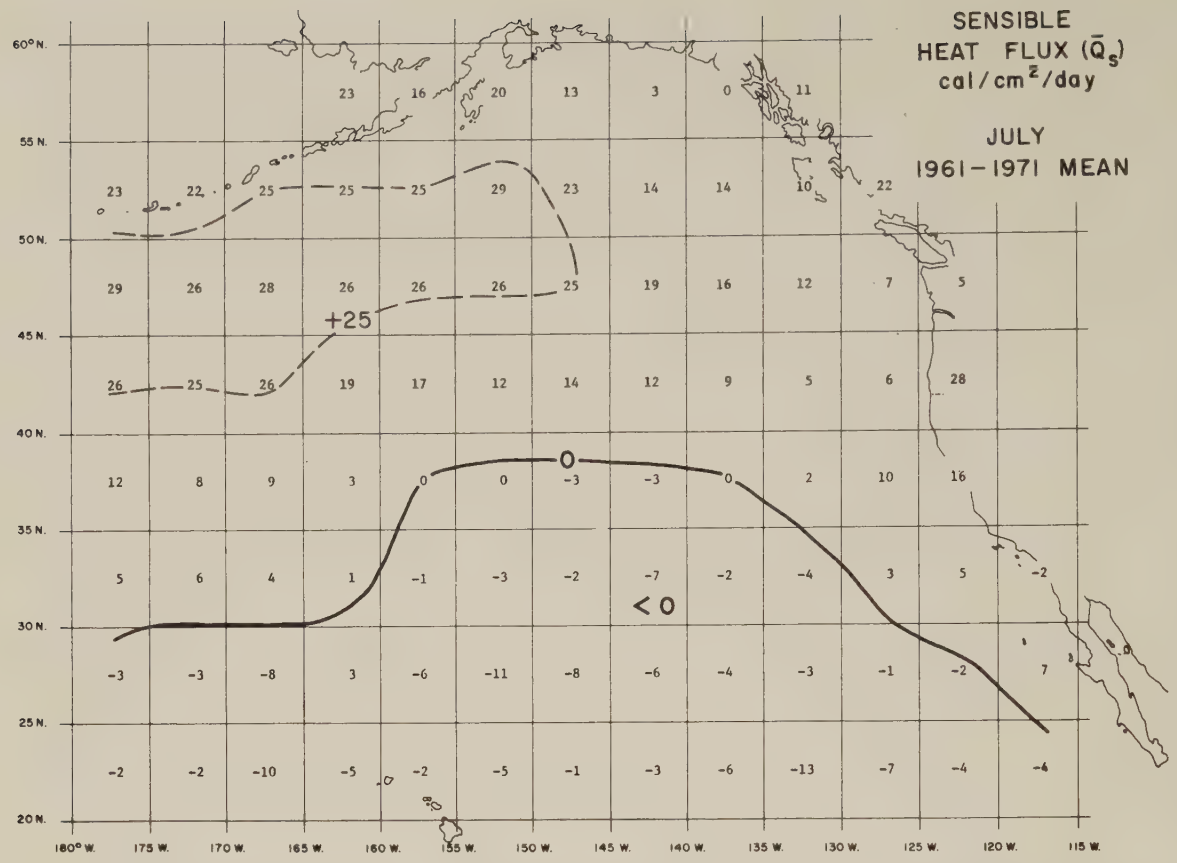


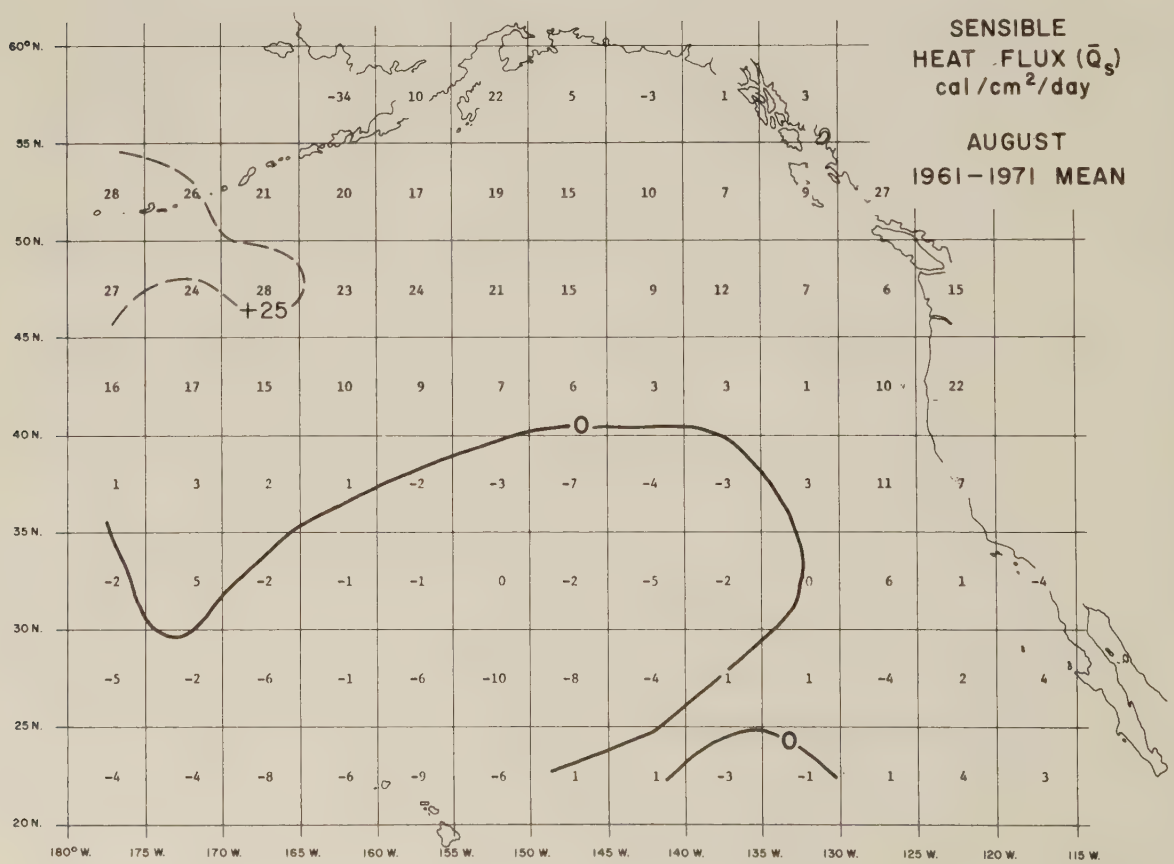

SENSIBLE
HEAT FLUX ($\bar{Q}_s$)
cal / cm^2/day
MARCH
1961 – 1971 MEAN
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.

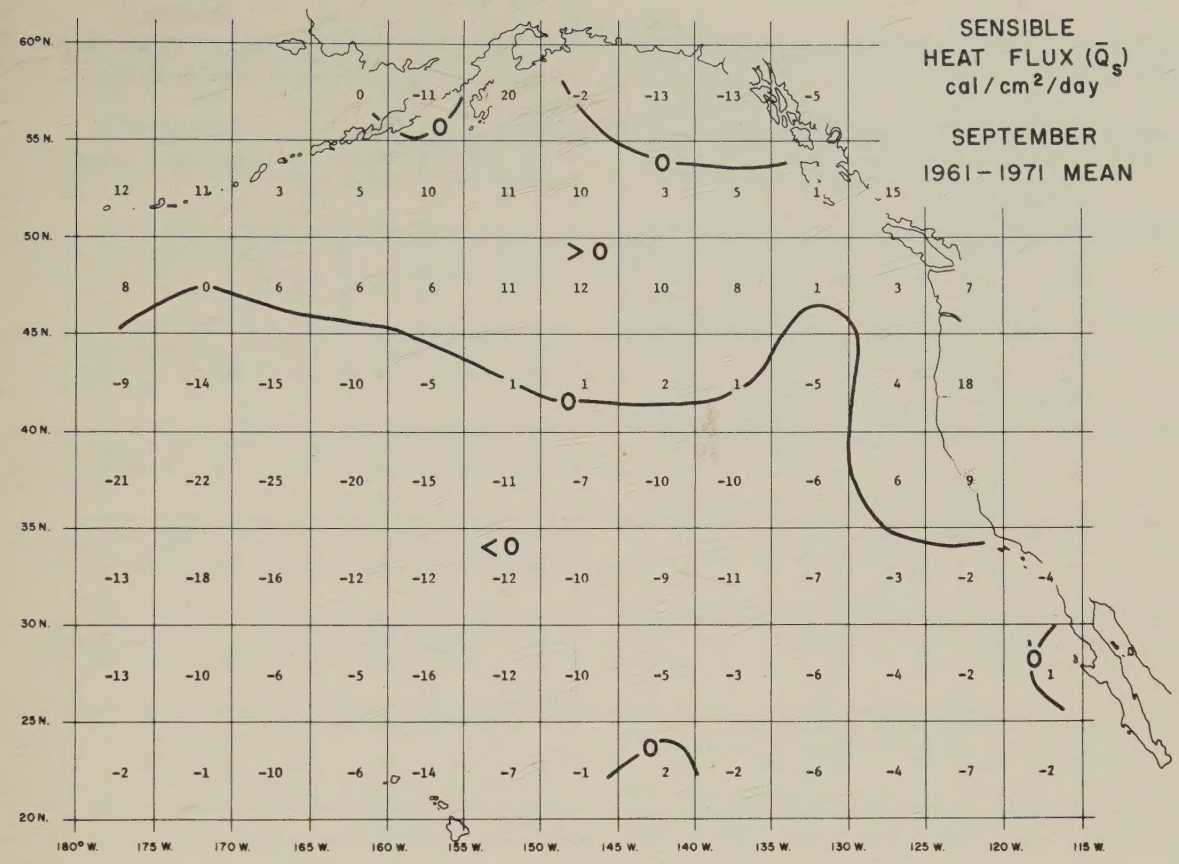

SENSIBLE
HEAT FLUX ($\bar{Q}_s$)
cal / cm^2/day
APRIL
1961 – 1971 MEAN
> 0
< 0
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.

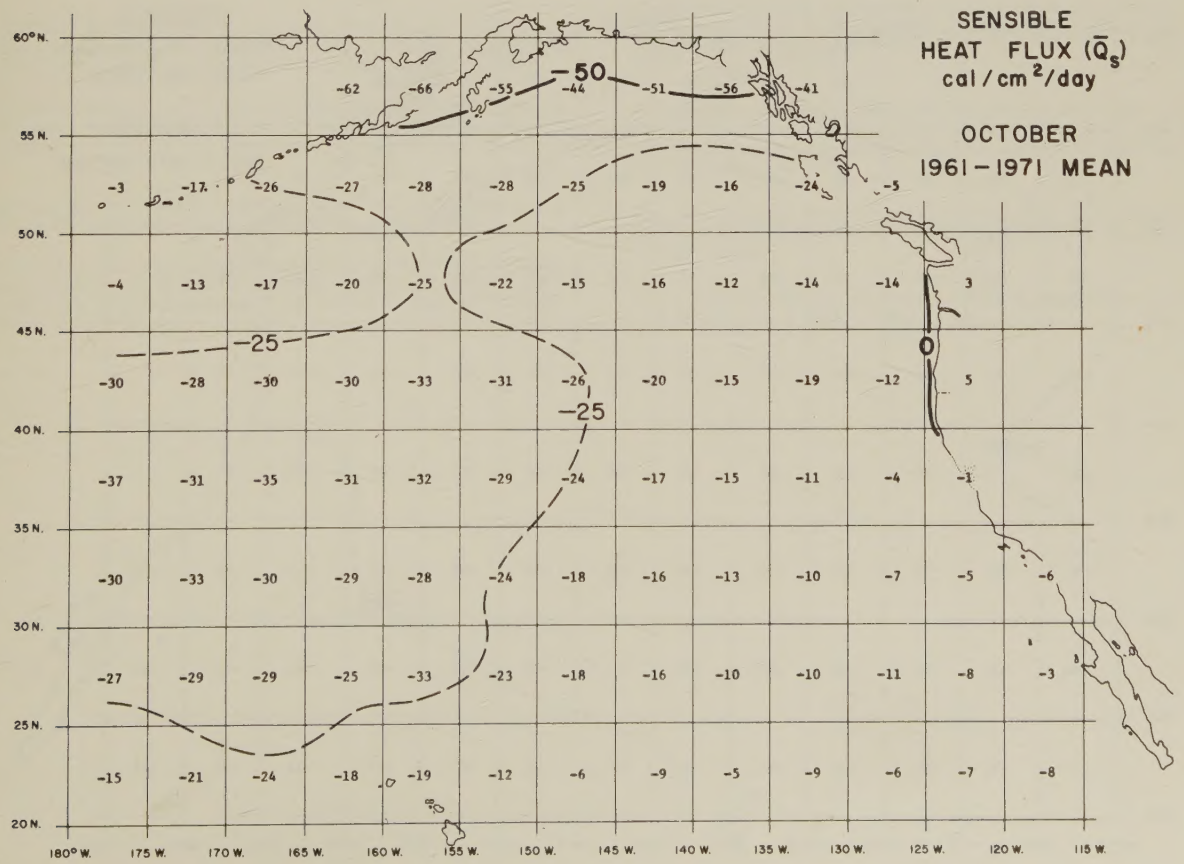

SENSIBLE
HEAT FLUX ($\bar{Q}_s$)
cal / cm^2 / day
MAY
1961 – 1971 MEAN
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
>0
<0

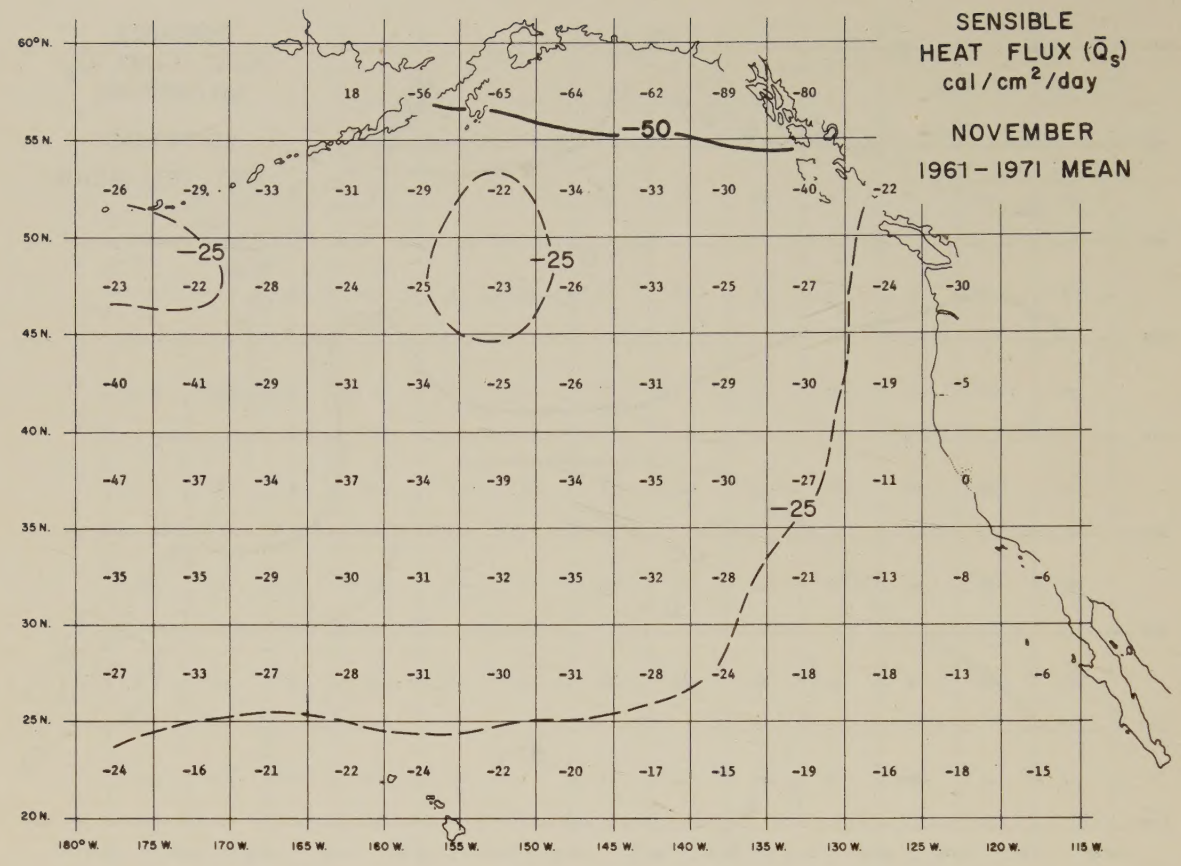

SENSIBLE
HEAT FLUX ($\bar{Q}_s$)
cal / cm^2 / day
JUNE
1961 – 1971 MEAN
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
+25
<0

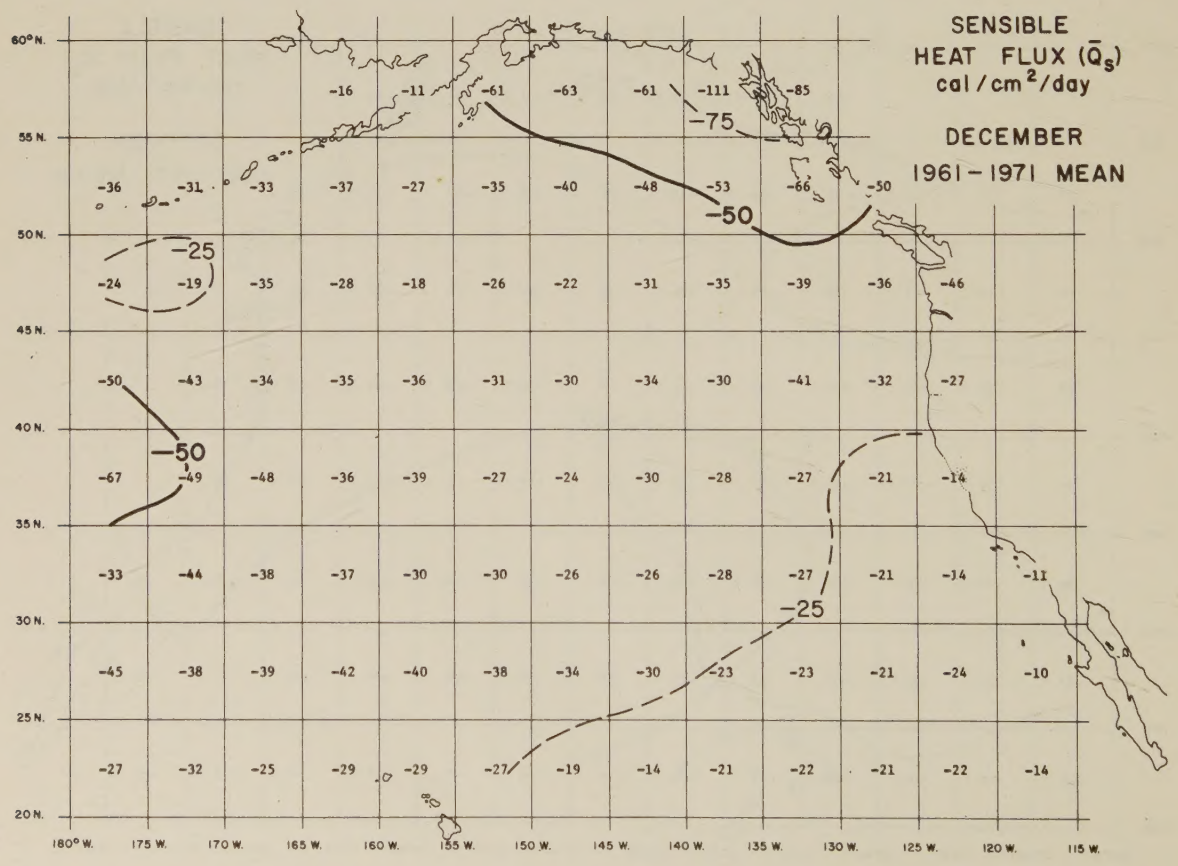

SENSIBLE
HEAT FLUX ($\bar{Q}_s$)
cal/cm²/day
JULY
1961–1971 MEAN
+25
0
< 0
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.


SENSIBLE
HEAT FLUX ($\bar{Q}_s$)
cal/cm²/day
AUGUST
1961–1971 MEAN
+25
0
0
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.


SENSIBLE
HEAT FLUX ($\bar{Q}_s$)
cal / cm^2/day
SEPTEMBER
1961 – 1971 MEAN
60°N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
0 -11 20 -2 -13 -13 -5
12 11 3 5 10 11 10 3 5 1 15
>0
8 0 6 6 6 11 12 10 8 1 3 7
-9 -14 -15 -10 -5 1 1 2 1 -5 4 18
-21 -22 -25 -20 -15 -11 -7 -10 -10 -6 6 9
<0
-13 -18 -16 -12 -12 -12 -10 -9 -11 -7 -3 -2 -4
-13 -10 -6 -5 -16 -12 -10 -5 -3 -6 -4 -2 1
-2 -1 -10 -6 -14 -7 -1 2 -2 -6 -4 -7 -2


SENSIBLE
HEAT FLUX ($\bar{Q}_s$)
cal / cm^2/day
OCTOBER
1961 – 1971 MEAN
60°N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
-62 -66 -55 -44 -51 -56 -41
-3 -17 -26 -27 -28 -28 -25 -19 -16 -24 -5
-4 -13 -17 -20 -25 -22 -15 -16 -12 -14 -14 3
-30 -28 -30 -30 -33 -31 -26 -20 -15 -19 -12 5
-37 -31 -35 -31 -32 -29 -24 -17 -15 -11 -4 -1
-30 -33 -30 -29 -28 -24 -18 -16 -13 -10 -7 -5 -6
-27 -29 -29 -25 -33 -23 -18 -16 -10 -10 -11 -8 -3
-15 -21 -24 -18 -19 -12 -6 -9 -5 -9 -6 -7 -8





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